THE AEROPLANE and ASTRONAUTICS

NOVEMBER [illegible] 1961

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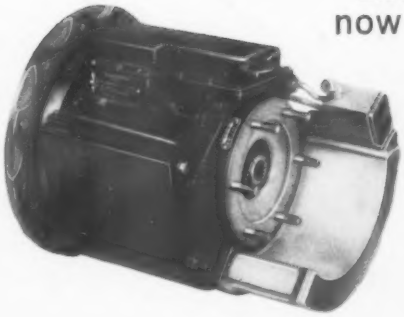

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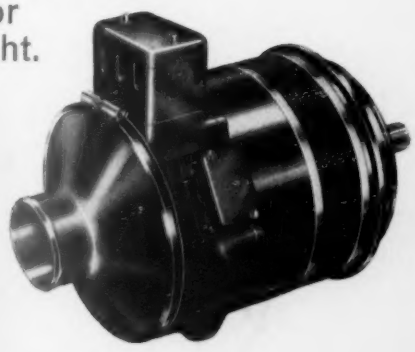

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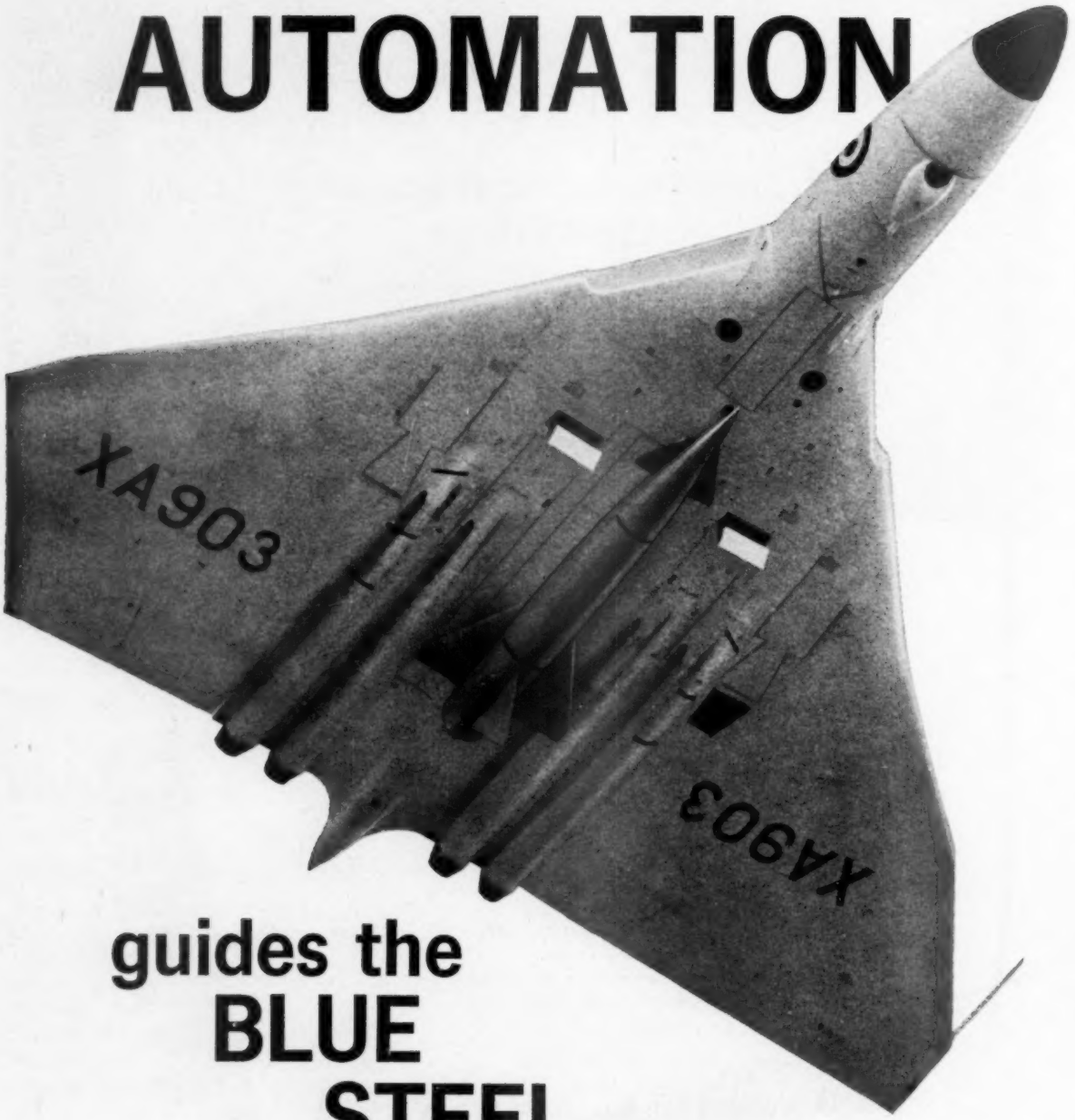
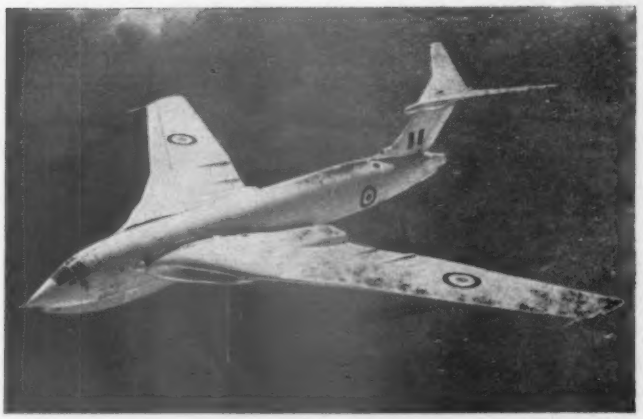
FAE 7

ELLIOTT

AUTOMATION



guides the
BLUE
STEEL
STAND-OFF BOMB



Above is the Handley Page Victor B.2, which together with the AVRO Vulcan forms Britain's Blue Steel carrier team.

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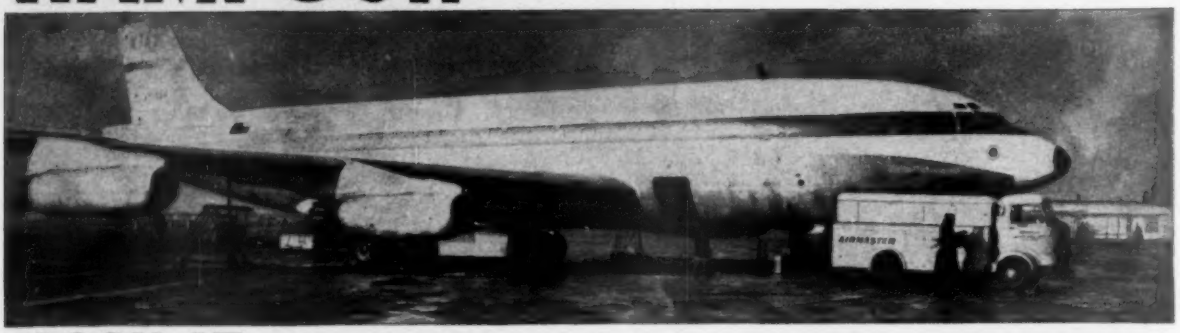

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John Fricker "The Aeroplane and Astronautics", September 21, 1961.

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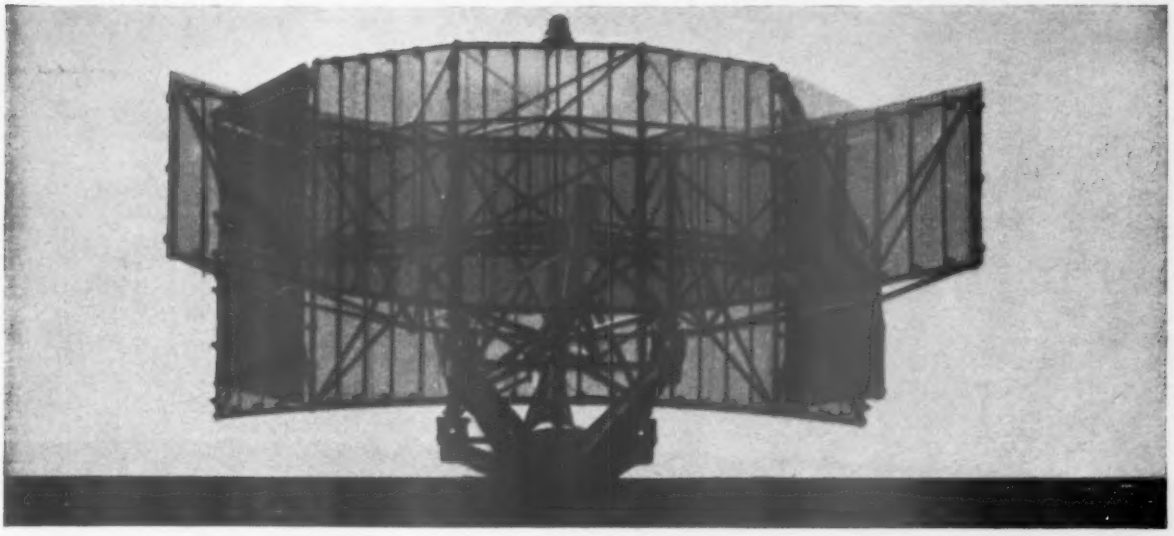

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Maiquetía Airport, Venezuela, is the site of the latest installation of the Decca DASR-1 civil surveillance radar. This key installation at one of the main staging centres on the air route between North and South America will be used to control dense air traffic of all types operating in and out of this first-class modern airport.

DASR-1 is a 10 cm., twin beam radar system specially designed to meet the exacting requirements of air traffic control authorities in congested and difficult regions, where jet and turbo-prop airliners are operating and where the risk of encountering small military aircraft must be guarded against.

DASR-1 is a high discrimination, high data rate radar with absolutely constant and gapless coverage through 360°. Performance exceeds 100 miles at 37,500 feet against a small airliner (ICAO standard 10 m^2 target).

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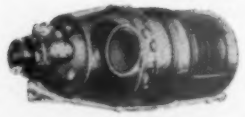
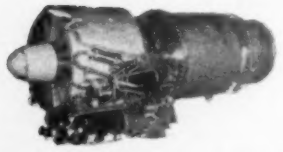
DR 168

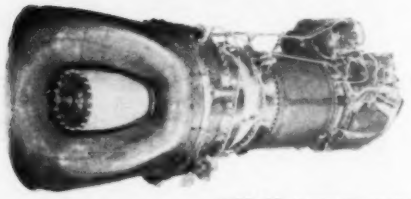
Power



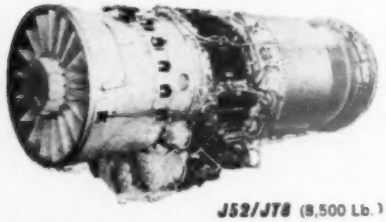
PT6 (500 Shaft HP)



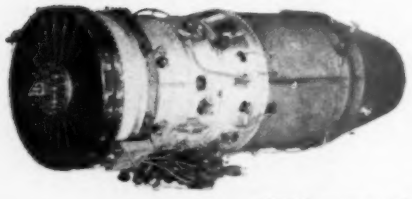
J60/JT12 SERIES (3,000-3,300 Lb.)



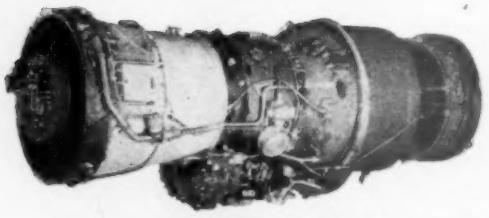
JFTD-12 (4,050 Shaft HP)



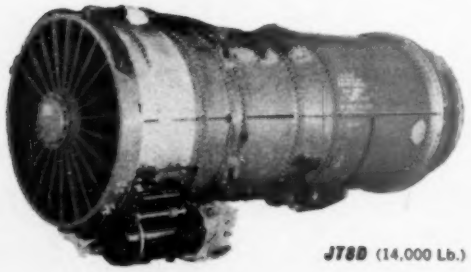
J52/JT8 (8,500 Lb.)



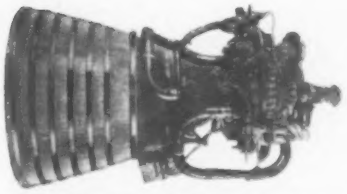
JTF10 (10,000 Lb.)



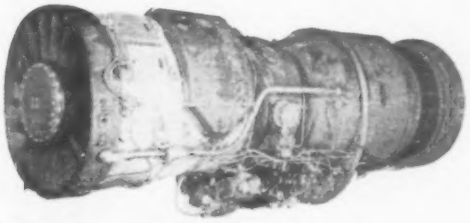
J57/JT3C SERIES (12,000-13,500 Lb.)



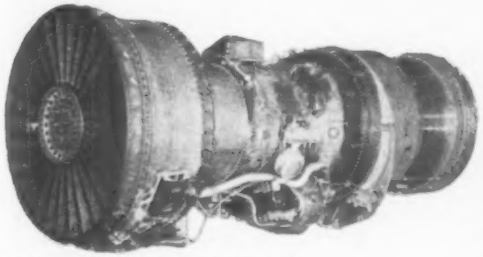
JT8D (14,000 Lb.)



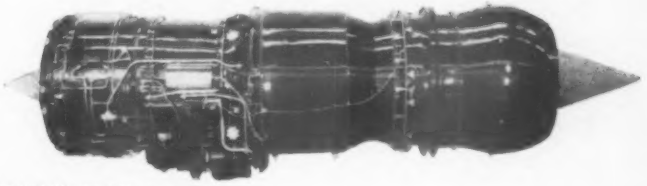
LIQUID HYDROGEN ROCKET ENGINE LR-115 (15,000 Lb.)



J75/JT4A (16,800-17,500 Lb.)



TF33/JT3D SERIES (17,000-18,000 Lb.)



J58/JT11 (30,000 Lb. class)

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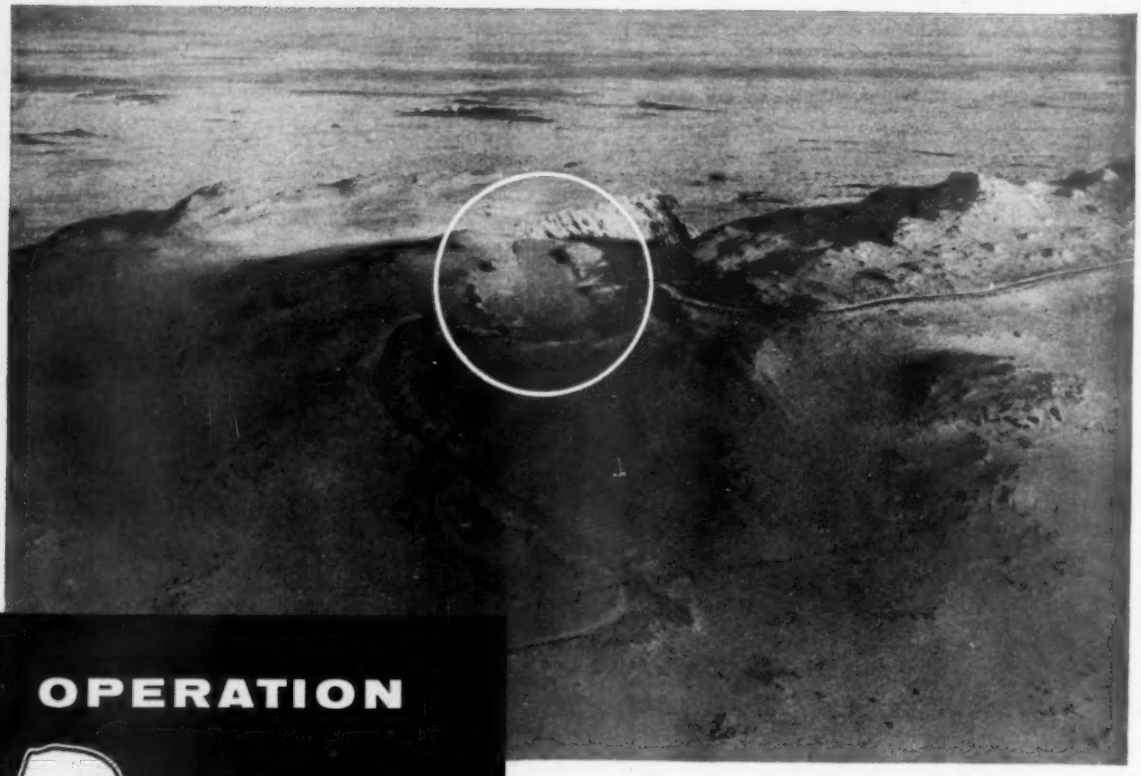

OPERATION STOL

A SUPREME TEST OF CARIBOU TAKE-OFF AND LANDING PERFORMANCE . . .

Time: Midwinter 1961. **Place:** Resolution Island, above Lat. 60°N. **Operation:** 25,000 lb. of U.S.A.F. high priority freight to airlift from Frobisher. Round trip distance, 390 miles. **Carrier:** Nordair Limited.

Landing Strip: Length, 1300 feet. Width, not over 100 feet for half its length—walled in by banks of snow-covered rock 10 feet high. **Runway Extensions:** None. Sheer drop 800 feet, east end. Fall-off 300 feet west end.

Facilities: Strictly VFR.

Cross Wind: 25 kts., gusting to 30 kts., 60 to 90 degrees to the strip 70% of the time. **Turbulence:** Severe. **Average Temperature:** 24° below zero.

Operation Summary: MISSION ACCOMPLISHED.

The Caribou unloading at Resolution Island airstrip, which lies contained throughout its entire length within the circle (upper photo). Wheeler Airlines' Otter (background) uses the strip regularly.

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THE AEROPLANE and ASTRONAUTICS

VOLUME 101 NUMBER 2613 NOVEMBER 16, 1961

Manpowered Debut

News that the group of enthusiasts at Southampton University have made sufficient progress with their one-manpower aeroplane for it to have flown for 50 yards, six feet above the ground, will have given fresh impetus to the efforts triggered off up and down the country first by Mr. B. S. Shenstone's theoretical work on the subject, co-ordinated by the Manpowered Aircraft Group, and then given practical aid and inducement by Mr. Kremer's generosity. It will not escape comment that the first reported successful effort to get a manpowered aircraft off the ground by any competitor has been achieved with a classical design of the utmost refinement.

Nothing has been heard now for quite a time either of flapping wings or of inflated structures. It has to be admitted that such a result is in accord with the beliefs of most of those who co-ordinated the early efforts under the inspiration of the late H. B. Irving. It would, however, be generally admitted, we suspect, that many people have a hankering for a break-through made by some unorthodox means—as for instance by some type of pedal-driven helicopter.

To achieve manpowered flight with the aid of a very high aspect ratio wing combined with the most ruthless weight control is not likely to produce a machine capable, for instance, of making prolonged soaring flights. On the other hand, the English are a race of sports enthusiasts and it is not difficult to foresee quite widespread interest in contests between manpowered aircraft under the strict rules of the appropriate sporting authority.

The problem that has yet to be solved concerns the amount of manpower to be employed. May we yet see the traditional eight-oared boats of the University Boat Race replaced by eight-manpower aircraft? We doubt whether it would be possible to employ a cox for steering only!

Faster Still and Faster

At the other end of the speed scale, another piece of news to capture the imagination last week was that concerning the remarkable performance of the North American X-15 in attaining a speed of more than 4,000 m.p.h.—more than two and a half times the present World air speed record figure. The next phase in the programme is to increase the altitude at which such speeds are attained, from the present 95,000 ft., to the maximum design altitude of 250,000 ft.

In this context of progress towards hypersonic operation well above the stratosphere it might be recalled that it was only five years ago that the World air speed record was first taken beyond 1,000 m.p.h.—by the Fairey Delta powered by a Rolls-Royce Avon. Now, such speeds—and much higher ones—are commonplace in Service aircraft, while the possibilities of civil supersonics are already well within sight. As a step in this particular direction on this side of the Atlantic, the Mach 2-3 all-steel Bristol Type 188 supersonic research aircraft is approaching its first flight date.

When this is achieved, the possibility of a British attempt on the World air speed record (at present standing at 1,525.5 m.p.h.) will doubtless be mooted. Many strong pressures may be brought to bear against it on the grounds of its interruption of the flight development programme. However much there may be to commend such a point of view, it must be measured against the stimulus that would undoubtedly come from the setting up of a new record by a British aeroplane.

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Matters of Moment

Powerplant Rationalization

ONE of the last remaining areas of the aircraft industry to be consolidated within the large Groups that now exist, is that represented by the de Havilland and Blackburn aero-engine companies. Until last week, these were part of the Hawker Siddeley Group and as such were independent of the industry's two main powerplant groups, Bristol Siddeley and Rolls-Royce. This situations has now been changed and the two smaller companies are now part of the Bristol Siddeley combine.

In this, of course, they are still linked with the Hawker Siddeley Group—which has a 50% holding in the share capital of Bristol Siddeley Engines Limited. According to the official statement, Bristol Siddeley has acquired from Hawker Siddeley, the full share capital of the two companies concerned; and Sir Roy Dobson has explained that the sale had been made for cash; it was, he said, a "tidying-up process" and was all part of the rationalization programme "which is going on apace."

With these new acquisitions, the Bristol Siddeley range of powerplants is now remarkably extensive. It will cover gas turbines of all sizes from very small to very large as well as a wide variety of rocket engines and ramjets.

Charges for Navigation Aids

THE main purpose of the Civil Aviation (Eurocontrol) Bill (presented to Parliament on Nov. 6) is to enable the United Kingdom to ratify the Eurocontrol Convention—but the special interest for air transport lies in Clause 4 by which the Minister of Aviation is permitted to make regulations for the payment of charges for air navigation services. The clause reads:—

"4-(1) The Minister may by statutory instrument make regulations for requiring the payment to the [European] Organization [for the Safety of Air Navigation] or to the Minister of charges of such amounts as may be prescribed by the regulations in respect of navigation services provided for aircraft, being services provided by the Organization in pursuance of the Convention, or provided by the Minister, as the case may be; and any sums received by the Minister under such regulations shall be paid into the Exchequer.

"(2) The liability for the charges payable by virtue of regulations under this section may be imposed upon the operators of aircraft for which those services are available (whether or not they are actually used or could be used with the equipment installed in the aircraft) or upon the managers of aerodromes used by such aircraft, or partly upon those operators and partly upon those managers."

So far as the U.K. is concerned, the charges, whether payable to the Organization or to the Ministry of Aviation, will be determined by the Minister with the consent of the Treasury.

The regulations "may" make provision for the operators and airport managers to keep records of the position of any aircraft at any time and of the contents of all radio messages. These can be either in writing or on any "disc, tape, sound-track, or other device . . .; any film . . .; and any photograph."

The Bill (Clause 6) includes some fairly heavy fines (up to £100) and/or imprisonment for any failure to keep the required records, for disclosing the information to unauthorized persons, or for falsifying the records in any way.

Contributions by the U.K. to the Eurocontrol Organization cannot at present be forecast, but the explanatory memorandum accompanying the Bill makes a guess at £3 million capital expenditure and some £2 million of recurrent expenditure "for a year early in the full operation of Eurocontrol."

The Convention was signed on Dec. 13 last year and the overall plans for Eurocontrol were outlined in our issue of Dec. 23 (p. 820).

HERALD IN ROME.—The prototype Handley Page Herald 200 arrived at Ciampino, on November 6, in order to carry out a series of demonstrations in Italy. Here, left to right, leaving the Herald after a demonstration flight are: Prince Caracciolo; Sir Ashley Clarke, British Ambassador; and Mr. R. H. Johnson of Handley Page.

Change of Transport

TAKING a leading place among the headlines last week was the Colonial Secretary's somewhat un-Ministerial and colourful return to the United Kingdom from Ghana in the nose of a Canberra. The B.O.A.C. Britannia carrying him had developed engine trouble en route and had had to turn back to Idris Airport, Tripoli. There, Mr. Duncan Sandys—with the aid of the R.A.F. Station Commander—virtually commandeered a Canberra bomber in which to complete his urgent journey.

For the flight from Idris to London (Heathrow) Airport he had no option but to lie in the bomb-aiming position, as the Canberra he chose (it was a B(I).8 long-range night interdictor belonging to No. 88 Squadron based at R.A.F. Wildenrath) was a two-crew version of this adaptable light bomber. Spending such a long time in this very forward position—which is normally only occupied for short periods during a high-altitude flight where the outside air temperature can be of the order of −56° C.—Mr. Sandys could not have had the most comfortable of journeys. His only protection from the several degrees of frost being transmitted through the transparent nose was standard Service flying kit and a tropical suit.

Piloted by Sqn. Ldr. Upton, who, with his navigator, was on a 2nd T.A.F. training flight from Germany, the Canberra covered the 1,400-odd miles between Idris and London in 3 hr. 16 min. It returned to Tripoli soon after Mr. Sandys left L.A.P. for his home and Admiralty House.

Astronautics and Hawker Siddeley

FOLLOWING a certain amount of widespread misunderstanding concerning Hawker Siddeley's future interest in astronautics arising from recent economy measures, the Group has issued the following statement:—

"Astronautics is now passing from the purely theoretical phase into one in which the practical engineering problems will form an increasingly large part of the programme; the company has therefore reorganized the Astronautics Group and placed it under the direction of Mr. G. K. C. Pardoe of the de Havilland Aircraft Company Limited. The team will be led by Mr. Geoffrey Coates, who is being transferred to de Havillands from the Hawker Siddeley Advanced Projects Group.

"This reorganization will enable the practical background of a well-known guided weapons team to augment the facilities at the disposal of the Astronautics Group. The company will continue to give active support to the aims and objectives of the British Space Development Company."

Names of the reconstituted space team were given in our issue last week (p. 618).

Decca Landing Guidance

POSSIBLE application of a hyperbolic coverage system for precision azimuth guidance and range information for automatic landing has been put forward by the Decca Navigator Co. Described by Mr. C. Powell at the recent BALPA Autoland Forum reported in our previous issue, this Decca Navigator type of aid is intended to replace leader cable azimuth guidance employed in the present B.L.E.U. Autoland System.

Based in principle on the small Decca chains used for survey work, the proposed system employs two phase-locked transmitting stations sited symmetrically about the runway axis. These master and slave transmitters would generate a stable pattern of constant-phase-difference lines to provide angular guidance information from a maximum range of eight miles

down to approximately two miles, and displacement information for at least one mile from touchdown.

For the last mile up to the threshold, the absolute accuracy of the overall system should be about 5 ft., and the sensitivity should be sufficient to detect a change of lateral position of less than 1 ft. In addition to providing approach guidance from either end of the runway, the system would also give ground-roll guidance along the full length of the runway. A monitor receiver would be sited near the centre portion of the runway, to serve as a local control on the radiated pattern.

In view of the low radiated power, Decca state that it would be possible to make the ground equipment extremely compact. Housed in a small trailer, the electronic units at each station should lie well within the compass of two boxes, 20 in. by 14 in. by 10 in., and fitted with whatever automatic changeover facilities were considered appropriate. For mobile operations a self-contained 24-v. supply would be required. It is estimated that with present techniques, the airborne receiver could be made to fit in a ½ ATR long-size box.

Range information, or more properly "along-track" information, could be provided by a second hyperbolic pattern radiated by either the use of a second slave station sited by the side of the runway, or the addition of another pair of master-slave stations placed on the extended centre-line of the runway. The first method provides a non-linear indication of distance along track, but this limitation is overcome by the second arrangement which could also provide position fixing for the control of aircraft on the ground.

New Record for the X-15

A NEW record speed of 4,093 m.p.h. was set up by Major Robert White in an X-15 rocket-powered research aircraft on Nov. 9. The aircraft had previously flown at 3,920 m.p.h.

It was the first time that the X-15 had been flown without speed restriction. Officials at Edwards Air Force Base stated that the aircraft travelled about 90 m.p.h. faster than its designed maximum speed. There are no plans to increase the speed still further. Maximum concentration will now be placed on achieving the maximum design altitude of 250,000 ft. It may be noted that North American originally gave the limiting speed as 4,500 m.p.h.

After leaving the B-52 parent aircraft, the X-15 climbed to a height of 95,800 ft. to achieve its maximum speed; propellent cut-off occurred after 86 seconds of flight. Parts of the aircraft reached a temperature of 1,100° F. under atmospheric friction. On the return leg of the trajectory—during the unpowered part of the flight—the outer glass of the wind-shield shattered on one side. Instructions radioed to Major White from the pilot of an accompanying "chase aircraft" helped him to bring the X-15 into a smooth landing on the dry lake.

Airport Gullibility

RESEARCH into the private lives of the burgeoning seagull population in the Boston area reveals that the airport bird hazard there is at least partially due to refuse dumped into Boston harbour.

The Massachusetts Audobon Society undertook the task of catching and dyeing 1,600 seagulls in different colours. The resultant 600 reports on sightings of coloured gulls gave the pattern of their movement in the Boston area. It showed that the seagulls were happily rearing their young on fish scraps and other garbage thrown into the harbour.

As a result of these findings, reported to the U.S. Fish and Wildlife Service, it has been recommended that dumping of fish refuse (from boats and wharves), garbage and raw sewage should be stopped. It is not indicated whether the presence of tea-leaves presented any special problem.

Progress with a Personal Helicopter

NOW undergoing flight test in America, the Enstrom Model F-28 two-seat helicopter has been fitted with a three-bladed main rotor in place of the two-bladed unit which it had earlier. This helicopter is interesting in having "rigid" metal blades carried in elastomeric bearings. This system simplifies the rotor hub by eliminating drag hinges and dampers, while the elastomeric bearings are said to reduce maintenance and increase bearing life. The use of off-set flapping hinges in the rotor head, it is claimed, increases the C.G. range and virtually removes all loading problems; at the same time the off-set hinges reduce blade flapping and increase the blade-stall flight speed as well.

A multiple V-belt transmission system with a single-stage bevel-gear reduction drive via a torque tube to the two-bladed rotor is used for the Enstrom F-28. In the belt drive is a controlled idler which eliminates the usual centrifugal clutch and cushions engine shock loads on the transmission system. The powerplant is a 180-b.h.p. Lycoming 0-36.

The main rotor diameter is 32 ft.; overall length, 29 ft. 5 in.; and height, 9 ft. 1 in. With an empty weight of 1,150 lb. and a gross weight of 1,850 lb., the F-28 has a useful load of 700 lb. Its designed maximum speed is 109 m.p.h.; cruising speed at 75% power, 90 m.p.h.; rate of climb, 1,125 ft./min.; service ceiling, 11,600 ft. and hovering ceiling, 5,000 ft. It has a range of 275 miles and a maximum duration of 3.85 hr.

Photograph copyright "The Aeroplane and Astronautics"

CITY SHOWING.—The work of the Royal Air Force was the theme this year of the Lord Mayor's Show on Nov. 11, and part of the R.A.F.'s contribution was a demonstration of helicopter operations over the Thames. Here a Belvedere approaches to deliver supplies. Details of the organization of the R.A.F.'s Belvedere squadrons are to be found on pages 645-647.

The Lesson of a Strike

OPERATIONS of all but three of the airlines using London (Heathrow) Central were affected, at the time this issue went to press, by the strike of loaders and porters at the airport. The strike began unofficially on Nov. 6 and was declared official five days later by the Transport and General Workers Union. When the strike became official, B.E.A. and other airlines withdrew volunteer labour which had been helping to load and unload aircraft.

All 950 strikers are employed by the Ministry of Aviation, and the strike is essentially a conflict between the trades unions and the Government over the latter's pay pause policy. In this dispute, the airlines are the helpless losers, and the situation points to the need for the operators to have control over apron services. From next April, all apron services at London Airport will be provided by an airline-controlled agency and, although this will not automatically resolve all employee-management disputes, it will at least place responsibility upon those directly affected.

None of the airlines using the North Terminal at London (Heathrow) was affected by the strike as they already handle their own apron services. So also do Air France, T.C.A. and K.L.M. in the Central Terminal and, with effect from last Monday, B.O.A.C. in the new long-haul building. B.E.A. was naturally one of the worst hit of all the airlines, and at the beginning of this week was cancelling approximately half of all scheduled flights including all Comet services. On Viscount and Vanguard flights still operating, passengers were allowed up to 20 lb. of carry-on baggage.

Matters of Moment . . . .

Rotary Wings From Cessna

THERE have been reports that Cessna Aircraft are considering the development of a two-seat autogyro-type rotary-wing craft for commercial use. It is quite possible that this craft is based on the company's Kinedyne, on which a design study has been carried out. The Kinedyne is intended as a replacement for the L-19 Bird Dog and possesses the more desirable features of the autogyro while eliminating the shortcomings experienced with older machines through the use of modern rotary-wing design techniques, a gas turbine powerplant and several new features.

It uses high-inertia rotor blades and a stored kinetic energy system for take-off and landing. A universally mounted teetering hub, with a small amount of built-in pre-cone angle, would be used with blade retention by means of a tension-torsion member composed of a stack of stainless steel straps.

Blades would be constructed of plastic-impregnated glass-fibre, through which run a large number of spanwise high-strength steel wires bonded along their entire length to form the major load-carrying structure. Stainless steel leading-edge members provide protection against erosion and abrasion. Fuselage would be an all-metal semi-monocoque structure.

The powerplant for the Kinedyne would be a small lightweight gas turbine, of approximately 250 h.p., mounted in the rear of the fuselage and driving two 6-ft.-dia. two-bladed counter-rotating fixed-pitch propellers. The air intake to the engine compressor is from a plenum chamber formed by a portion of the fuselage rear section. Openings in the skin around the upper portion of the rear fuselage permit entry of air into the plenum chamber and these openings are expected to have a "decidedly beneficial" effect on propeller efficiency through a boundary-layer control effect on the fuselage.

For controlling the Kinedyne, a collective-pitch lever would normally be used primarily for take-off and landing. Direct hub tilting for lateral and longitudinal control will be through dual cyclic control sticks. Conventional rudders are employed for directional control in forward flight.

DESIGN DATA

Dimensions.—Main rotor diameter, 28 ft.; fuselage length, 11.20 ft;. overall height, 8.50 ft.

Weight.—Gross, 2,450 lb.

Performance.—Maximum speed, 135 m.p.h.; rate of climb, 910 ft./min.; service ceiling (gross weight), 18,000 ft. plus; range, 475 miles; power-off autorotational descent, 1,700 ft./min. from 13,000 ft. to 1,500 ft./min. at sea level.

Air Matters in Parliament

Tour Licences for Foreign Operators

IN the House of Commons on Nov. 6 MR. C. A. JOHNSON (Lab., Lewisham, S.) raised the question as to whether, when foreign operators apply to stage air tours in and from this country, adequate powers exist to ascertain such operators' competence to carry out the services proposed. He asked the Minister of Aviation if he will introduce legislation to ensure protection of the public if tours, when licensed, fail to materialize.

In reply, MR. C. M. WOODHOUSE, Parliamentary Secretary to the Ministry of Aviation, said that the issue of tour licences in this country for foreign registered aircraft is the sole responsibility of the Minister, whose powers are adequate in this connection. The Air Transport Licensing Board has here no jurisdiction, and is concerned only with flights by aircraft registered in the U.K.

MR. R. MASON (Lab., Barnsley) asked if it would be possible for independent airlines to register their aircraft overseas and thus to by-pass our regulations. Mr. Woodhouse promised to look into that point.

Parking at London Airport

MR. E. D. L. DU CANN (Cons., Taunton) asked what are the Ministry's proposals for improving car parking facilities at London Airport. Mr. Woodhouse stated that tenders have been invited for design and construction of a multi-storey garage to be completed in 1963, and that the Ministry is discussing with several private concerns the possibility of improving and extending parking arrangements outside the airport and for ferrying cars to and from the Central Area. He undertook that this matter will be pressed on with all possible speed.

With the imminent coming into use of the new central airport passenger building this parking business assumes even greater urgency, if only by contrast with other facilities.

NATO and VTOL Aircraft

MR. E. J. ST. L. STRACHEY (Lab., Dundee, W.) asked the Minister of Defence on Nov. 8 if there is a NATO requirement for development of a VTOL fighter and/or strike aircraft; and whether such an aircraft would be equipped to deliver conventional or tactical nuclear weapons in the first instance. MR. H. A. WATKINSON replied that NATO authorities and a number of NATO countries are considering the application of the VTOL principle to future aircraft, but exactly what detailed specifications are now being discussed he could not disclose. He hoped that our Hawker P.1127, with whose development the West German Government have already joined us, and also our Short VTOL project would be very seriously considered. He took note of a suggestion by MR. J. B. EDEN (Cons., Bournemouth) that, considering that the Hawker P.1127 is now flying, it would be advantageous both to the industry and to the Service if a limited number could be supplied now to the R.A.F. to give operational experience.

Jet Noise Around London Airport

On the motion for adjournment on Nov. 10 MR. A. H. F. ROYLE (Cons., Richmond, Surrey) inaugurated a debate on aircraft noise in the vicinity of London Airport, in which he was supported by members for nearby constituencies from both sides of the House. Mr. Royle assessed that nearly half a million people around London Airport were regularly disturbed by aircraft noise, but suggested that the nuisance would be substantially abated if all big jets scrupulously obeyed the minimum height regulations on approach. A recent check, he said, indicated that the black sheep amounted to some 12% of the flock of Comets and Boeing 707s. Which pilots and airlines, he asked, had been involved in breaches in the past 12 months and what were the penalties?

MR. A. E. HUNTER (Lab., Feltham) said he questioned if all the present night flying was necessary, and MR. D. G. SMITH (Cons., Brentford and Chiswick) felt that members should know exactly what sanctions were imposed for breaches, and be assured that anyone who offended consistently was in danger of losing his licence. MR. A. M. SKEFFINGTON (Lab., Hayes and Harlington) said that with increasing traffic many of those affected were suffering an unwarrantable degree of disturbance, annoyance and nuisance.

Replying for the Ministry of Aviation, MR. WOODHOUSE told the House that to sample the nuisance at first hand he had earlier in the week spent a night at London Airport, and had a perfectly good night's sleep. He regretted he could not undertake that all jet flights should be stopped between 11 p.m. and 7 a.m., as these night flights brought jet air travel within the reach of many thousands who would not otherwise be able to travel by air. Automatic monitoring equipment to be installed at high cost in the next few years would enable nearly every take-off to be monitored. Infringement of noise standards laid down had decreased encouragingly in the past year.

Mr. Woodhouse said there had been 13 infringements in the 860 approaches checked (less than 2%) and the lowest approach detected was not more than 200 ft. below the glide path at a distance of four miles. During the present winter, B.E.A., M.E.A., Olympic and Swissair are permitted a total of 36 night movements a week at London Airport.—O. W. H. COOKE.

Aviation News in General

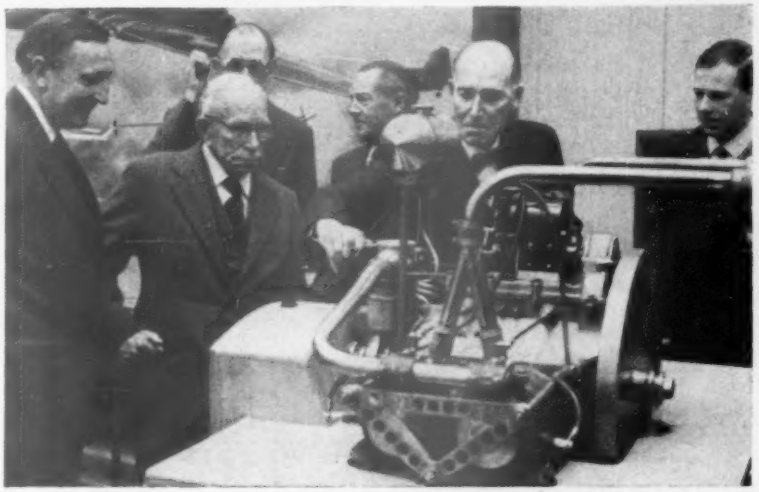
FOKKER'S FIRST STARFIGHTER.—Two weeks ahead of schedule, the first Fokker-assembled F-104G made a 25-min. first flight on Nov. 11. A. P. Moll, the company's chief test pilot, was at the controls. Much of the flight was made at Mach 1.5 after take-off climb to supersonic speed. Fokker is part of the ARGE Nord European manufacturing group.

SPERRY CONTRACTS.—The West German Defence Ministry has placed two orders, worth together approximately £250,000, with the Sperry Gyroscope Co. for aircraft instruments and spares. These follow the recent £500,000 Australian contract for Sperry twin gyro platforms for R.A.A.F. Mirage 3s announced last week. Worth several million, the company's order book is now the largest for many years.

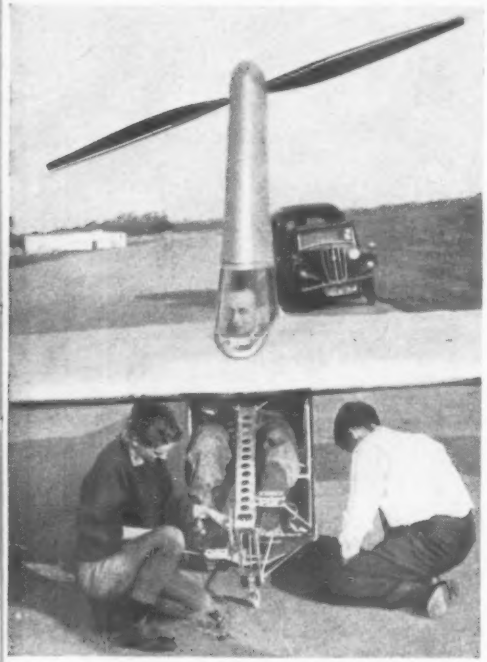
TRIDENTS REGISTERED. — The B.E.A. fleet of de Havilland Tridents has now been registered. They will be G-ARPA to G-ARPP inclusive, G-ARPR to G-ARPU inclusive and G-ARPW to G-ARPZ inclusive.

AIR SAFETY REPORT.—President Kennedy has accepted the Project Beacon report on air traffic control and has instructed the F.A.A. to implement its recommendations. The report will be summarized in our next issue.

SUCCESSFUL DRONE.—Canberra U.10 target drones operated by the R.A.A.F. at Woomera and by the Royal Navy off Malta for guided weapon trials have made more than 30 flights at 50-54,000 ft. without loss of an aircraft. With other types of drone aircraft about one in every 15 is lost through failure of the guidance or control system. The U.10 is able to remain airborne at these heights long enough for three or four separate missile firings to be made during each flight.



HISTORY RE-LIVED.—At Leavesden on Nov. 13 in the presence of fellow founder directors of the great company which bears his name, Sir Geoffrey de Havilland started a working replica of the engine he designed and with which he made his first flight in 1909 and flights with his second aeroplane in 1910. L. to R. Mr. Hugh Buckingham (managing director, de Havilland Engine Co.), Mr. C. C. Walker (founder director), Mr. W. E. Nixon (founder director), Mr. F. E. N. St. Barbe (founder director), Sir Geoffrey with hand on throttle, and Mr. A. R. Organ, Technical School Apprentice, representing those who built the replica. The fifth founder director, Mr. F. T. Hearle, was unfortunately indisposed.



MUSCLE-POWER SUCCESS.—First of the new British manpowered aircraft designs to fly was the "Sumpac" built by the Southampton University group. Last week, as a result of some powerful pedalling by Derek Piggott, Lasham C.F.I., it travelled some 50 yd. at a height of 6 ft.

PIONEER PHASE-OUT.—After 56 have come off the assembly line Scottish Aviation has ceased production of the Pioneer due to lack of orders. Twin Pioneer production continues.

BUSINESS FOR BOEING. — New U.S.A.F. contracts awarded to Boeing are valued at $85.8 million. Production orders for the KC-135A and C-135A account for $50 million; the rest is allotted to the Minuteman ICBM programme.

THUNDERCHIEF RE-ORDER. — More F-105D Thunderchiefs have been ordered by the U.S.A.F. under a $46.9 m. contract placed with Republic. The number of aircraft involved has not been disclosed.

SIPA ANTELOPE.—Details have been announced in France of the SIPA-251 Antelope turboprop lightplane under development in collaboration with the Italian Procaer company. The four-seat Antelope will be powered by a 560 h.p. Astazou II engine and the prototype is to fly next spring. Other data include: span, 32 ft. 9 in.; length, 27 ft. 6 in.; gross weight, 3,200 lb.; cruising speed, 264 knots at 5,000 ft.

FREIGHT SYSTEM TRIALS. — Blackburn Aircraft's side-guidance system, a method of providing forward, sideways and upwards restraint for loaded platforms intended for dropping by parachute, was installed in a U.S.A.F. C-130 Hercules recently for trials at Boscombe Down. Purpose of these was to assess the suitability of the equipment for standardizing in British, American and Commonwealth transports.

V-BOMBER EXPORTS?—At the time of going to press Handley Page had no comment to make on a newspaper report that the South African Air Force is considering the purchase of a number of Victors as part of a major military re-equipment programme.

OPPORTUNITY FOR A JOURNALIST

A VACANCY exists for a senior editorial assistant on the staff of THE AEROPLANE AND ASTRONAUTICS, to be responsible for all aspects of the production of the journal. This vacancy arises from an expansion in editorial policy and is additional to present staff. Applicants for this post—which offers considerable prospects—should be 25 to 35 years of age and have experience of make-up and sub-editing; a knowledge of the aviation industry would be advantageous but is not essential.

YS-11 ORDERS.—Ten YS-11 twin-Dart transports are to be purchased for military duties by the Japanese Air Self-Defence Force. They will be used for various duties, including electronic training, troop carrying and cargo transport.

DELT-AIR TRAGEDY.—The Delt-Air 250 (see our issue for Nov. 9, p. 627) crashed a few moments after its first take-off, on Nov. 8. The all-metal lightplane dived into the ground and Herbert S. Dean, its designer-builder, died in hospital.

ITALIAN SATELLITE.—Italy's scientific satellite (p. 651) to be launched in 1963-64 from a "floating platform" located between the Red Sea and the Indian Ocean will involve a launching vehicle "not entirely of Italian construction but produced in conjunction with NASA."

AVIATION ART.—Our gliding correspondent, Dr. A. E. Slater, surveys some of the works at the Kronfeld Club's annual exhibition of aviation paintings and drawings on view in the basement of 74 Eccleston Square, London, S.W.1, until Nov. 25.

Photograph copyright "The Aeroplane and Astronautics"

LAUNCH PAD.—Following the recent London conference concerning the European Launcher Development Organization, Mr. Hulme, Australia's Minister of Supply, has stated that a Blue Streak launching pad is already within three months of completion. This was due to work carried out before the rocket was abandoned as a weapon.

MERCURY DELAY.—The attempt to launch a chimpanzee in a Mercury capsule, originally scheduled for Nov. 14 at Cape Canaveral, has been postponed because of the discovery of a leak in the hydrogen peroxide gas-jet orientation system. The three-orbit test mission, to be performed with a modified Atlas-D ICBM as booster, is regarded as the prelude to the orbiting of a human astronaut.

MISFIRE. — Goliath, a squirrel monkey lying in a 70-lb. padded capsule near the base of a 12-ft. long nose-cone, perished in the explosion of an Atlas-E ICBM above Cape Canaveral on Nov. 10. The missile which should have sent the re-entry cone 650 miles into space for parachute recovery of the capsule near Ascension Island, some 5,000 miles downrange, was destroyed by the range safety officer when it veered from course.

DYNA-SOAR FUNDS. — The U.S. Administration has declined to sanction an extra $86 million voted by Congress earlier this year to expedite the Dyna-Soar programme.

Missile Monographs

Temple Press Limited is publishing a series of monographs on rockets and missiles. The first of these, "Short-range Guided Weapons," by J. Clemow, M.A., A.M.I.E.E., price 15s., became available yesterday, Nov. 15, and surveys the principles underlying the design of tactical guided weapons. Intention of the series as a whole is to provide the educated layman as well as the scientifically and technically informed with inexpensive treatises which, though elementary, are reliable introductions to the theory and practice of controlled missiles. Other titles planned, to be available next year, are: Missile Control; Missile Guidance; Aerodynamics; Solid-fuel Rocket Propulsion; Ramjet Propulsion; and Telemetry.

POLARIS RECORD. — The U.S. nuclear submarine, "Ethan Allen," successfully fired its sixth Polaris while submerged off Cape Canaveral on Nov. 8. The missile travelled some 1,500 miles. The lauching was the 24th success in 37 submerged Polaris firings by six nuclear submarines over a period of 18 months.

RED SAM.—Seen in Red Square during last week's military parade, this missile appears to be a "second generation" SAM in the tradition of the familar M-2. Of canard configuration, it is without tandem boost and may employ a two-stage integral solid motor; weather covers shroud the exhaust nozzle.

Commercial Aviation Affairs

JAMAICA AND B.W.I.A. — The Trinidad Government, which took over B.O.A.C.'s share in B.W.I.A. on Nov. 1, is reported to be alarmed at the prospect of Jamaica setting up its own international airline. Following the Jamaican Prime Minister's announcement (see our previous issue) a delegation from Trinidad comprising the Attorney General, the D.C.A. and the chairman of B.W.I.A. visited Kingston to discuss the position and make proposals. Both governments are now studying the matter.

PRESTWICK SERVICE — Dan-Air Services has been granted an "A" licence by the A.T.L.B. to fly a daily scheduled tourist-class and freight service between London (Gatwick) and Prestwick. Manchester is an optional stop, with no traffic rights between London and Manchester. The application was opposed by B.E.A., B.U.A. and British Railways. Parallel applications for Prestwick-Dundee and Prestwick-Newcastle services were refused by the Board.

U.K.-CANADA PACT.—The present bilateral agreement between the U.K. and Canada is to be reviewed early next year and the position of Canadian Pacific Airlines will then be reconsidered. For the present, Britain is withholding permission for C.P.A. to operate its Vancouver-London service for which (see our issue of Oct. 26, p. 540) permission had, after a long delay, been granted by the Canadian Government.

ANGLO-ITALIAN BILATERAL.—Agreement has been reached in Rome on modifications and extensions of the existing bilateral air agreement between Italy and the U.K. The new agreement covers a five-year period and establishes new route schedules to replace those in the existing agreement.

PROFITS DOWN.—U.S. trunk airlines report a profit of $1,348,000 (£482,000) for August compared with $3,715,000 (£1,327,000) for the same month a year ago. In July, 1961, the airlines had a loss of $1,473,000 (£526,000). The August profit reduces the loss for the first eight months of the year to $13,316,000 (£4,760,000) compared with a profit of $1,851,000 (£660,000) for the comparable period in 1960. The U.S. trunk airlines are American, Braniff, Continental, Delta, Eastern, National, Northeast, Northwest, Trans World, United and Western.

MIDDLE EAST CHANGE.—As from Nov. 1 Kuwait Airways will, in place of M.E.A., provide Viscounts to operate Gulf Aviation's Kuwait-Doha-Dubai-Sharjah services.

990 CERTIFICATED. — Provisional certification has been approved for the Convair 990 by the F.A.A. and full certification is expected in December. Customers are American Airlines, Swissair, S.A.S. and Varig.

CALEDONIAN EQUIPMENT. — A DC-7C has been leased from Sabena by Caledonian Airways, the recently formed charter company with offices at Prestwick and Gatwick (see our previous issue). Under the terms of the agreement, Sabena will maintain the aircraft and supply spares. The DC-7C is a 104-seater and will be used for group charter flights. Delivery was to be made on Nov. 15.

CZECH BRITANNIA. — C.S.A., the Czech state airline, has purchased or leased a Bristol Britannia from Cubana. The aircraft is believed to be that leased earlier this year by Cunard Eagle and operated as G-APYY for the past summer. The deal may be related to the recent supply of Ilyushin Il-14s (or Czech-built Avia 14s) to Cuba.

B.U.A. TERMINAL.—Work started last Monday on British United Airways' new passenger terminal (on stilts) between platforms 16 and 17 at Victoria Station, London.

(Continued on page 653)

Air Transport

The Argosy with B.E.A.

ROUTE training flights with the Armstrong Whitworth Argosy by B.E.A. were to begin earlier this week. According to plans at the time of going to press, the first such flights were to be made on Nov. 14, and consist of round flights between London and Paris and London and Jersey. Flights to Milan, Copenhagen, Düsseldorf and Frankfurt are to be made between now and Nov. 24, in some cases replacing scheduled Viscount freight services. Scheduled operation of the Argosy by B.E.A. will begin on Nov. 26.

As already recorded, B.E.A. took delivery of its first Argosy on Nov. 6. This is the first of three at present on order for the Corporation—the other two are to be delivered before the end of this year. All three are from the original batch of 10 Argosies laid down by the makers on speculation and are of the 100 Series. Changes for B.E.A. include blanking off the windows, some modifications in the cockpit and making provision for the use of Rollamat. Since its delivery the first Argosy has been at Stansted for crew training.

Argosy utilization will be built up steadily during the winter months, the target being to achieve 120 hours' scheduled flying a week with the three aircraft by next February.

This initial target will be achieved by flying the following services each week: London-Copenhagen, six; London-Manchester, two; London-Manchester-Glasgow, three; London-Jersey, four; London-Frankfurt-Düsseldorf, six; London-Milan, four; London-Paris, four.

New Vehicle-ferry Services

NOW that the A.T.L.B.-licensed services from Southend to Basle and Geneva have been approved by the Swiss Government, and approval for that to Strasbourg is expected, Channel Air Bridge has announced starting dates and frequencies. All will start in the first fortnight of April, 1962 (2nd, Geneva; 6th, Basle; 11th, Strasbourg), with, during the peak season (mid-May to October), a daily return service to Strasbourg (the only direct one from London) and four-times-weekly services to Basle and Geneva. Off-season frequencies will be two-three-times weekly to all three points.

The services will be operated by ATL-98 Carvairs, three of which will be available for use by April. Two Carvairs will be used for the longer-haul services and the third will normally be operating on the Rotterdam service and periodically (to show the flag) on the Calais and Ostend services.

The first Carvair has resumed its flight trials and is now within about 40 flying hours of its British C. of A. It is also to be certificated to F.A.A. standards so as to meet the requirements of all prospective overseas customers.

Contrary to some expectations outside Channel Air Bridge, the need for these deep-penetration services has shown itself to be very real—so much so that more than 100 firm bookings have already been received for next summer. Swissair has been very co-operative and Carvair capacity will be valuable in permitting the considerable London-Basle-London cargo potentialities to be developed—potentialities which cannot be met by fill-up capacity on normal passenger services.

Aviation Traders' car lifts will be maintained for use at each airport normally used by the Carvair. The approval for the services to Switzerland and Germany covers the carriage of passengers and supplementary passengers as well as of freight and vehicles. The Carvair has a 23-seat cabin and toilet in the aft section of the fuselage; refreshments and meals will be served on the longer-haul services.

Single rates for vehicles vary between £7 and £25, according to overall length, on the services to Basle and Strasbourg, and from £8 10s. to £26 10s. to Geneva. Provisional return passenger fares are £27 to Strasbourg, £28 2s. to Basle and £30 to Geneva, with a 23-day excursion rate of £24 3s. to Strasbourg (Monday-Friday only). Departures from Southend are at 09.20 and 09.45 hrs. for Strasbourg and Geneva, and at 15.40 hrs. for Basle; return flights leave (respectively) at 12.25, 13.05 and 19.00 hrs.

Black Isle Air Services

FURTHER applications have been made to the A.T.L.B. by Black Isle Air Services which, contrary to the information given in our previous issue (p. 592), has no financial or other connection with Capital Services (Aero), Ltd., of Renfrew. The new company has hired aircraft from Capital Services on recent occasions pending delivery of its Piper Aztec with which, it is planned, scheduled services will be operated from Inverness. Black Isle's address is Transport House, Beauly, Inverness.

The new applications are for services on the routes Inverness-Stornoway-Benbecula and Inverness-Dornoth (opt.)-Orkney-Shetland. Equipment would be the Aztec initially and Rapide later. Both these routes (omitting Dornoth) are at present served by B.E.A. and are among the so-called "social service" routes which are non-profitable.

Competition for the One-Eleven

BRANIFF AIRWAYS' recent order for six B.A.C. One-Eleven short-haul jet transports has triggered off a new wave of interest in this category of aeroplane among the U.S. trunk operators. American, Eastern, T.W.A., National, Delta, Continental and Western are among the airlines which are showing interest in some form of short-haul equipment, although this ranges from lightweight versions of the Boeing 727 at one end of the scale all the way to large turbine-powered helicopters at the other end. To date, the British Aircraft Corporation remains the only manufacturer in the World committed to production of a jet transport in this category and there is little evidence that any U.S. company is close to embarking on a similar project.

Eastern Air Lines, meanwhile, has drawn up a detailed specification for a short-haul twin-jet which would be rear-engined with Pratt & Whitney JTF10 turbofans. Key points of the Eastern specification are listed below, together with current B.A.C. specifications for comparison:—

	Eastern	B.A.C. One-Eleven
Gross weight	65,000 lb.	68,250 lb.
Passengers	44-48	57
Maximum payload	13,000 lb.	14,000 lb.
High-lift devices:—		
Leading edge	None	None
Trailing edge	Double-slotted Fowler or simpler	Single-slotted Fowler
B.L.C.	Blown flaps optional	None
Field-length required (90°F., 300-mile range)	4,200 ft.	5,800 ft.
Cruising speed	500 m.p.h. ±30	500/540 m.p.h.
Crew	Two	Two/three
A.P.U.	Yes	Yes
Maximum cabin width	118 in.	124 in.
Minimum cabin height	78 in.	78 in.

As will be seen, the most serious discrepancy between the two specifications is in the take-off field performance. The Eastern requirement in this respect is a singularly tough one and may prove impossible to obtain without a serious economic penalty.

Of the known American projects in this category, a Douglas design study, known as Model 2086, is believed to come closest to the Eastern specification. Details of this project, published in America, show that it has the following characteristics: Span, 84.7 ft.; length, 95.3 ft.; sweepback, 24 deg.; accommodation, 56 first class, 77 max.; gross weight, 69,000 lb.; cruising speed, 550 m.p.h. at 20,000 ft.; field length, required (90° F., 56 passengers for 300 miles), 5,000 ft. Powered by two rear-mounted 10,000-lb.s.t. JTF10A-2 turbofans, the Model 2086 would have double-slotted flaps, but no leading-edge high-lift devices.

Douglas estimates the direct operating costs at less than $1 a mile for ranges over 300 miles. This agrees with Eastern estimates of the cost of the aeroplane outlined in their specification at about 98 cents. The direct aircraft-mile costs of the BAC One-Eleven fall from $1 at 300 miles to just over 70 cents at 1,000 miles.

Boeing (with their Model 737), Convair and Lockheed have also been studying aircraft of this type, but none appears anxious to commit itself to production—Boeing is fully committed to 707/720/727 production, Convair has its hands full with the Coronado, and Douglas is spending its own money to launch the DC-8F Jet Trader. According to some reports, Lockheed is more anxious to establish itself in the supersonic transport field.

Competition for the One-Eleven might come, therefore, from Sikorsky, with their S-65 helicopter. This is a derivative of the S-64 flying crane, with a fuselage for 60 passengers. Cruising at 150 knots, it would operate on 100-mile sectors at costs as low as half those of Convair 440s and Martin 404s, according to data provided to Eastern Air Lines.

Air Transport . . . .

FIRST DEPARTURE.—Tokyo-bound, the Comet G-APDH was the first B.O.A.C. departure from the new long-haul building at London (Heathrow) Central which came into use last Monday morning. The Comet is seen here from the apron control office on the roof of the new building, which is described and illustrated on pages 642-643 of this issue.

Photograph copyright "The Aeroplane and Astronautics"

U.S. Civil Aviation Facts and Figures

OF the total passenger-miles flown in the U.S. in 1960, 47% relate to coach and economy services, and amount to 14,000 million—a 17% increase over 1959. These figures are revealed in the *Statistical Handbook of Aviation* just published by the Federal Aviation Agency.

The total of 56 million passengers carried in 1960 is 2% up on the 1959 figure; more than 30,000 million passenger-miles were flown, an increase of 4%; and revenue miles flown dropped 3% to 814 million.

During 1960, 6.4 million sea and air passengers travelled to or from the U.S. More than three-quarters of these flew and over half of these used U.S.-flag carriers. Carrier revenue-miles and ton-miles flown dropped sharply, although mail ton-miles rose 61% to more than 10 million.

A total of 238 transport aircraft were produced in 1960 for a record high value of $1,000 million—9% fewer aircraft than in 1959, but worth 31% more. Production of single-engined, one-to-three-seat aircraft dropped 17% and four-seat aircraft production dropped 1% by comparison with the previous year. Multi-engined aircraft output increased by 27%.

At Jan. 1, 1961, the U.S. active aircraft fleet totalled 78,760, an increase of 8,013 on Jan. 1, 1960. Airline transport aircraft accounted for 2,211 of the total—191 more than the previous year. Multi-engined aircraft used in general aviation increased by 1,209 to 7,243. Single-engined aircraft with four or more seats increased to 34,327 from 27,301.

A New Maintenance Yardstick

FOR a six-month trial period, the F.A.A. and U.S. airlines will introduce a new method of checking engine maintenance. Replacing the usual arbitrary engine overhaul period, the new system depends on establishing a reliability index for each airframe/engine combination.

The F.A.A. has set an "alert value" for each engine, comprising a rate of total engine shutdowns per 1,000 engine hours. If this alert value is exceeded, the F.A.A. and the airline concerned will work together to restore it. Airlines will submit, monthly, records of in-flight engine shutdowns in the previous three months; critical shutdowns—those which may cause structural damage, generate "projectiles" or fires, or adversely affect control of the aircraft—have to be reported immediately. Corrective programmes, after analysis by the F.A.A., will be passed on to other airlines having similar troubles.

This new system is obviously of particular value to those airlines which have adopted progressive maintenance programmes. The six-month trial will begin on Dec. 1 and if successful will be applied industry-wide and extended to other components.

BIATA's Year

THE capacity produced during the year ended March 31, 1961, by the 13 member airlines of the British Independent Air Transport Association on all their operations was 235,314,000 ton-miles. In other words, BIATA airlines were responsible for about 22% of the total British air transport effort during the period.

The overall load factor for scheduled services and charter and contract operations was 72.5%; on scheduled services it was 63.8%—or 3.5 points lower than in 1959-60. Scheduled service load ton-miles represented about 34% and passenger-miles about 24% of the total achieved on all operations.

In last year's report of the Association a serious drop in inclusive tour traffic was recorded. This was believed to be largely due to the expansion of I.T. facilities on normal scheduled services and to an extension in the operation of "closed group" charters, and was viewed with concern by the Association. During 1960-61 the I.T. position greatly improved and there was an increase of 24% in passenger-miles and of 19% in the number of passengers. The principal need, the latest report says, is to provide scope for the long-term promotion and development of I.T. services, both domestic and international. Long-term licences (for domestic services) and special bilateral or multilateral arrangements (for international services) will be necessary if there is to be positive long-term forward planning.

The most significant BIATA traffic increases were on internal services. There were 49% more passengers overall and 113% more on normal domestic services (i.e. other than those to the Channel Islands and Isle of Man). Since there was no great increase in the route mileage, this result can only be described as the successful outcome of perseverence by the operators concerned.

The "fluid" nature of the scheduled air-freight position was emphasized by the fact that—after two successive years of very large increases in total tonnage and ton-miles performed—the 1960-61 figures showed increases of only 15% in uplifted tonnage and 11% in ton-miles. These figures include vehicles on the scheduled vehicle-ferry services (which account for most of the scheduled freight) and the rate of increase here was considerably lower than in 1959-60. Freight, other than vehicles, however, maintained a high rate of increase—approximately 30%, for instance, on the short cross-Channel services. So, as the report says, an overall assessment of pure freight operations "must therefore be optimistic."

BIATA TRAFFIC RESULTS
(April 1, 1960—March 31, 1961)

		% change on 1959-60
Scheduled Services		
Capacity ton-miles	65,575,000	+26
Load ton-miles	41,818,000	+20
Overall load factor	63.8%	−3.5*
Passengers	1,318,732	+39
Passenger-miles	277,293,000	+27
Freight (short tons)	108,594	+15
Freight ton-miles	16,852,000	+11
Mail (short tons)	12	+66
Mail ton-miles	34,000	+98
Aircraft miles	14,726,000	+21
Inclusive Tours		
Capacity ton-miles	14,350,000	+27
Passengers	198,689	+19
Passenger-miles	135,962,000	+24
Charter and Contract Operations		
Capacity ton-miles	155,389,000	+24
Load ton-miles	118,210,000	+12
Passengers carried (civil)	395,595	+121
" " (military)	171,138	+44
" " (total)	566,733	+93
Passenger miles (civil)	219,386,000	+143
" " (military)	520,346,000	+24
" " (total)	739,732,000	+44
Freight (short tons)	28,789	+70
Freight ton-miles	51,226,000	−11
Aircraft miles	26,582,000	+19

*Actual variation.

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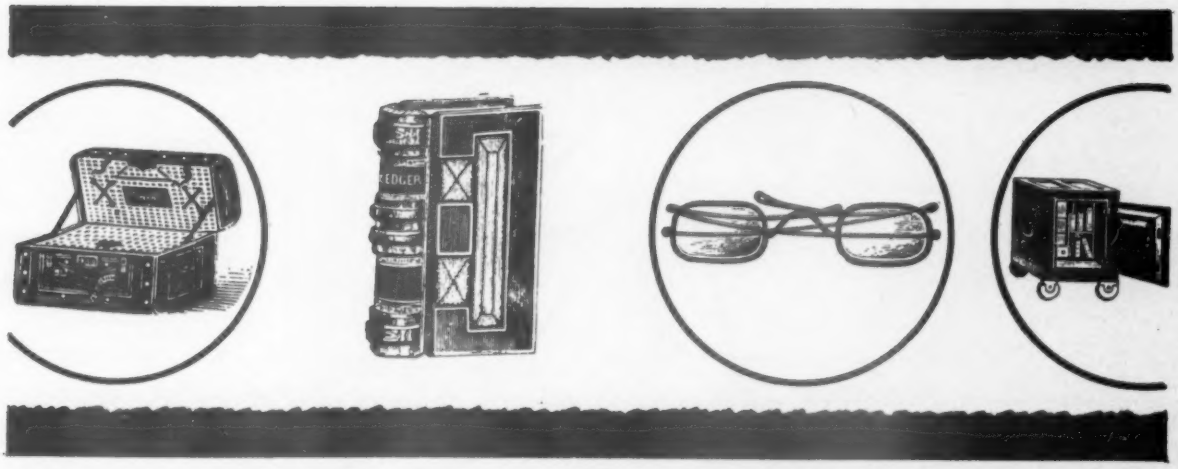

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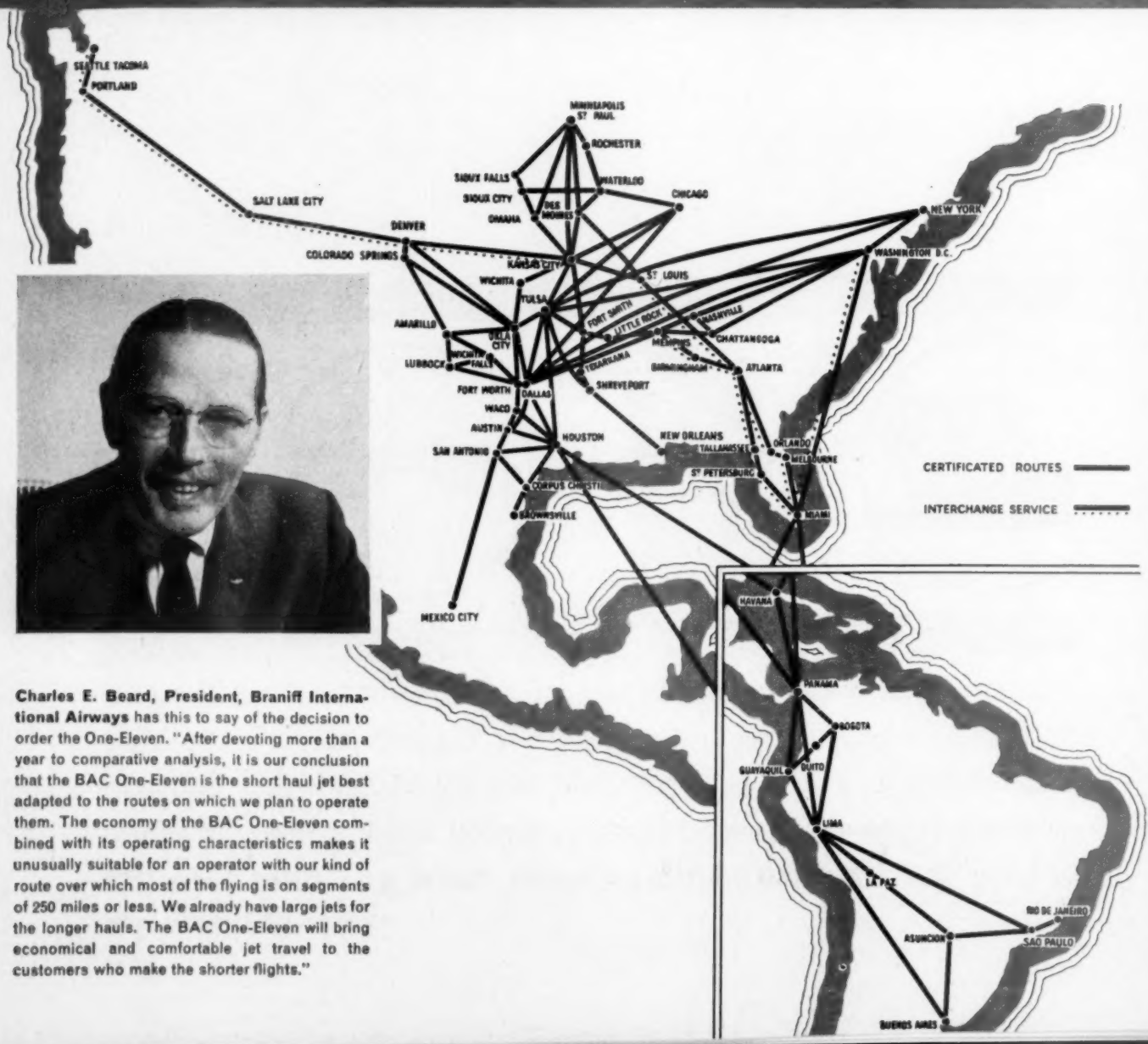
BRANIFF *International* AIRWAYS



Charles E. Beard, President, Braniff International Airways has this to say of the decision to order the One-Eleven. "After devoting more than a year to comparative analysis, it is our conclusion that the BAC One-Eleven is the short haul jet best adapted to the routes on which we plan to operate them. The economy of the BAC One-Eleven combined with its operating characteristics makes it unusually suitable for an operator with our kind of route over which most of the flying is on segments of 250 miles or less. We already have large jets for the longer hauls. The BAC One-Eleven will bring economical and comfortable jet travel to the customers who make the shorter flights."

CHOOSES

BAC ONE-ELEVEN

THE SHORT HAUL JET

BAC ONE-ELEVEN

TWO ROLLS-ROYCE SPEY TURBOFAN ENGINES

THE SHORT HAUL JET

WITH EVEN BETTER THAN VISCOUNT ECONOMICS

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TP 9

T.W.A. TERMINAL.—Nearing completion at New York International Airport is the new T.W.A. unit terminal, consisting (in the airline's own words) of "four interacting vaults, with the two lateral vaults soaring into daring cantilevers, 54 ft. high at their apex." The new building is adjacent to the Wing Building in which B.O.A.C. is located (right foreground).

Air versus Rail in Japan

ON a number of trunk and local routes in Japan more travellers now go by air than by train. This interesting fact emerges from statistics for 1960 published in the Japanese monthly *Aireview*.

Japan Air Lines and All Nippon Airways together carried 91% of all travellers between Tokyo and Sapporo, the Japan National Railway taking 9%. Between Tokyo and Fukuoka, J.A.L. carried 70% and the railway 30% while, on the third trunk route, J.A.L. and All Nippon together took 40% of the total. Taking the three trunk routes together, 756,731 passengers went by air and 738,158 by rail.

Of the nine local services listed, all flown by A.N.A., three show a majority of travellers going by air and two others with the traffic nearly equally divided between air and rail. The total number of air passengers on these nine routes in 1960 was 219,175, compared with 530,977 by rail.

There has been a rapid growth of air traffic in Japan since 1952. In that year the number of passengers on domestic trunk routes was 98,735. By 1960 this figure had increased 862%. Traffic on the local services has almost doubled since 1957.

The African Hearings

BRITISH EUROPEAN AIRWAYS will appear as an objector when B.O.A.C.'s application in respect of certain routes to Africa are heard by the A.T.L.B. at a series of major hearings to begin next Tuesday, Nov. 21. Also to be heard are applications from B.U.A. and Starways for routes to African destinations.

The B.E.A. objection is based on B.O.A.C.'s request to include Brussels as an optional traffic point on four licences which at present cover the services to Entebbe, Nairobi, Dar-es-Salaam, Johannesburg and Lagos. B.O.A.C. already operates through a number of European points, including Frankfurt, Dusseldorf, Geneva, Zurich, Rome, Barcelona and Athens. These points are served under the terms of an agreement between the two Corporations concluded in January, 1958, when B.E.A. extended its routes to Beirut, Tel Aviv and Cairo. For each European destination, operations by B.O.A.C. in excess of an agreed number of services are in pool with B.E.A.

The 1958 agreement left B.O.A.C. "free, after consultation with B.E.A., to apply for permission to operate through any point in Europe it may desire." B.E.A. presumably objects to the Brussels application because of the effect it might have on its own carryings under the existing Anglo-Belgian bilateral and also, perhaps, because of the objections it has already made against independent operators coming on to the Brussels routes. B.U.A. also is opposing the B.O.A.C. applications, for different reasons.

British United Airways has withdrawn two applications (which were among the first submitted to the A.T.L.B.) for services to Cairo, Luxor and Khartoum. This leaves the company with three applications for African services, all of which will be taken as part of the series of hearings starting next week. They are for services to Kano, Leopoldville, Elisabethville, Usumbura, Johannesburg; Gibraltar, Las Palmas or Tenerife, Freetown, Lagos; and Entebbe or Nairobi, Mauritius. B.E.A. and B.O.A.C. oppose these applications.

Starways has applied for a service from Glasgow, Liverpool and Manchester to Gibraltar, Bathurst, Freetown, Accra and Lagos. This is opposed by B.O.A.C., B.E.A. and B.U.A.

The Lagging Practice of Meteorology

IN its latest reference document* the IATA technical secretariat is constructively critical of the lack of progress made in the science and practice of meteorology. Intensified research and the application of methods of automatic measurement are urged. The introduction of the turbojet has emphasized the importance of more accurate measurements and forecasting, and preparations must soon be made for the new problems likely to be met in the era of the supersonic transport.

At one time it was supposed that, with the expectation of improved de-icing methods, of high-altitude operation and of such developments as weather radar, air transport would become progressively less dependent on meteorological information. In fact, though the technical expectations have been realized, the overall need for reliable and accurate meteorological information is even greater on balance than it was. The needs, in particular, for accurate landing and take-off weather forecasts and for high-altitude wind information are much more vital than they were.

The 140-page document deals in detail with the major requirements and objectives in a fully organized meteorological service, and stresses certain particular research and development needs. Among these are:—

Means for the reliable prediction of the location and intensity of clear-air turbulence—using, perhaps, high-frequency waves sensitive to air motions, or equipment for measuring temperature gradients in the vicinity of the aircraft.

The use of automatic recording systems for aerodrome observations—not only to make these more accurate and complete, independently of human ability, but to save manpower and to provide more directly comparable results.

The full and proper interpretation of ground and airborne radar echoes in relation to the detection, for instance, of hail; measurement of the composition of the atmosphere above

* "Requirements for Meteorological Service for International Air Transport Operations." International Air Transport Association, Terminal Centre Building, Montreal 3, P.Q., Canada.

Air Transport . . . .

40,000 ft.; and information about the formation, structure and characteristics of cirrus clouds.

Improvements are also needed in the performance of radiosonde techniques and in the quick reproduction of weather charts with a high degree of definition.

Of likely SST requirements one of the more important is to find means of measuring and forecasting any large and rapid temperature variations at high altitudes, and to learn more about turbulence at very high levels.

"E"-class Licences Approved

FOLLOWING the public hearings on Oct. 9 and 10, the A.T.L.B. has granted "E"-class licences to the following operators: B.E.A., B.O.A.C., B.U.A., B.U.A. (Services), Caledonian Airways (Prestwick), Cunard Eagle Airways, Dan-Air Services, Eagle Aviation, East Anglian Flying Services, Manx Airlines, Morton Air Services and Silver City Airways.

An "E" licence allows an operator to carry closed groups (whose offices are in the U.K. or the majority of whose members are normally resident in the U.K.) without restriction as to the points of take-off or landing. The licences now approved by the A.T.L.B. are valid to the end of 1962 and there are a number of restrictions as to the types of aircraft and number of flights which can be made on each licence.

At the public hearing, applications were also heard from a number of other operators, including Airlines (Jersey), Autair, B.K.S., Derby Aviation, Executive Air Transport, Lloyd International, Mercury Airlines, Skyways, Skyways Coach Air, Starways, Tradair, Westpoint Aviation and World Wide Aviation. The Board has not yet announced its decision in these cases, partly, we understand, because it has not yet completed its review of the financial status of some of these companies as required by Section 2(2)(a) of the Act.

The A.T.L.B. to Move

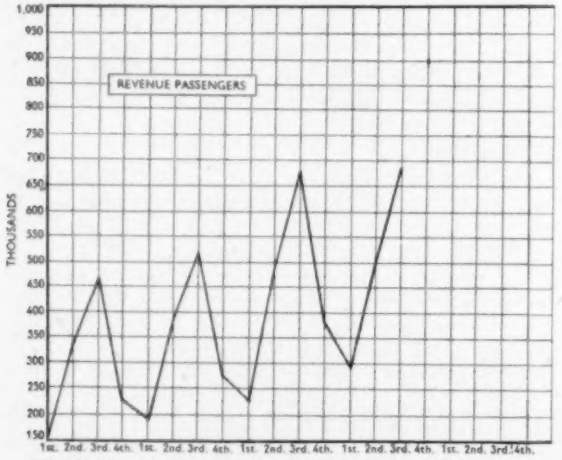
NEW premises are being sought to house the Air Transport Licensing Board, which moved into Therese House, E.C.1, only last March from its temporary abode in Dean's Yard, Westminster. This news was given in a Parliamentary answer last week when Mr. C. M. Woodhouse said that the Minister "hopes soon to be able to offer the Board suitable accommodation in a more convenient place."

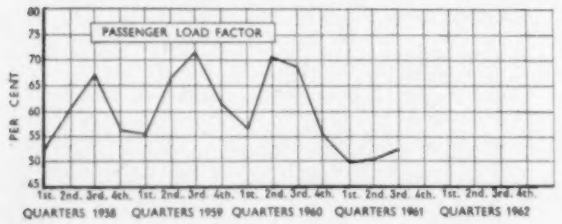
Therese House—a new building in Glasshouse Yard, just off Aldersgate Street—was criticized by the Board itself in strong terms in its annual report last month. It was pointed out that the location was far removed from the west side of London, where most air operators and travel agents have their London offices; that it was in "a depressing and unattractive area of bombed sites, dilapidated premises and intensive building activity" and that external noise is a major nuisance; and that no space had been provided for the Board to sit in two divisions, as it is able to do under its constitution.

North Atlantic Traffic Trends

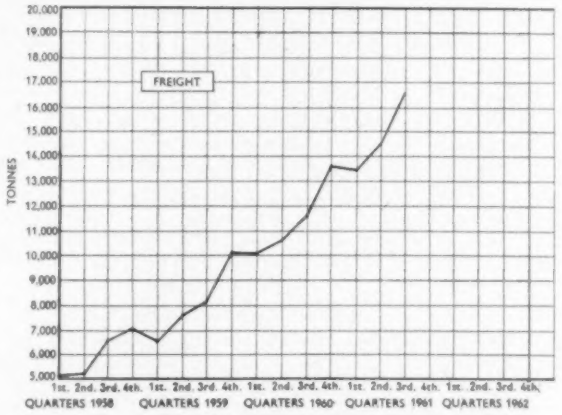
THE increase in the number of passengers flying across the North Atlantic in the third quarter of the year was 3.1%, compared with a 4.5% increase in the second quarter. This was one of the smallest quarterly increases in North Atlantic traffic in recent years. The number of passengers carried by IATA airlines in the first nine months of 1961 is 7.8% up on the same period of 1960.

Statistics for the third quarter are tabulated here, and the trends are shown graphically. Once again there was a massive increase in capacity on the route (34.8%), well above the most optimistic forecast of traffic increase that could have been made even without allowing for the recession which has in fact occurred. The discrepancy between capacity increase and traffic growth knocked 16 percentage points off the third quarter load factor by comparison with that of 1960.





Freight, on the other hand, continued to display a vigorous growth rate, at 42.9%. This result was helped by the special airlift, during August, of 1,120 tonnes of insecticide to Egypt (see our issue for Sept. 7), but, even if this particular operation is excluded, the third quarter total is still 32.5% above that for the equivalent period last year. The quarterly result hides the set-back in freight during September, when carryings fell 11.4% below the 1960 figure for the month. It remains to be seen whether this setback is continued into the fourth quarter.



THIRD QUARTER 1961

	Eastbound	Westbound	Total	Change over 1960
Scheduled passenger flights	5,056	5,143	10,199	+14.1%
Scheduled cargo flights	512	412	924	
Seats offered				
First	99,959	100,109	200,068	—
Economy	551,848	561,981	1,113,829	—
Total	651,807	662,090	1,313,897	+34.8%
Revenue passengers				
First	32,442	36,489	68,931	—
Economy	257,758	364,033	621,791	—
Total	290,200	400,522	690,722	+3.1%
Passenger load factor				
First	—	—	34.5%	—
Economy	—	—	55.8%	—
Total	—	—	52.6%	−16.1 points
Freight (kg.)				
Passenger flights	5,142,464	4,759,360	9,901,824	—
Cargo flights	4,074,779	2,691,995	6,766,774	—
Total	9,217,243	7,451,355	16,668,598	+42.9%
Mail (kg.)	2,844,778	1,758,180	4,602,958	+14.6%

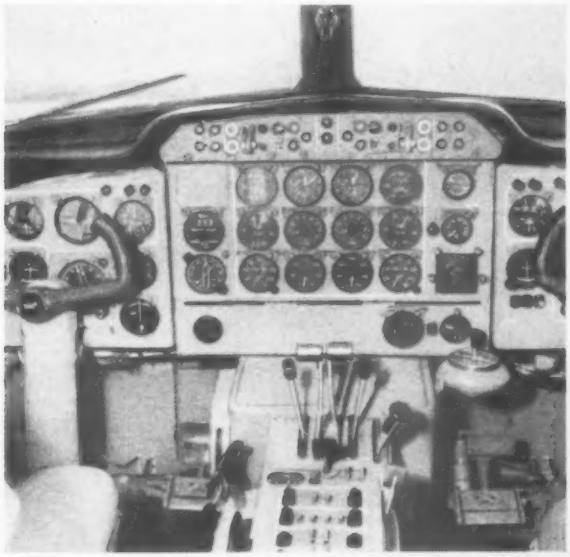
THE AEROPLANE and ASTRONAUTICS
NOVEMBER 16, 1961

Skyways' Avro 748

Above, the Avro 748 crosses the airfield boundary at Lympne. (See our previous issue.)

Air Transport . . .

Below, the uncluttered flight deck. Radio is grouped in the central roof panel and in the Skyways' version includes Bendix VOR/ILS, ADF and twin VHF.



Above, forty-four reclining seats by Aircraft Furnishing Ltd., in grey upholstery, are standard in the Skyways Coach Air layout.

Right, at the rear of the cabin, is a small galley with detachable units, and a folding seat for two cabin staff.

Right, three Avro 748s will replace four DC-3s on Skyways' Coach Air operations next year. The new and the old are seen together here.

Photographs copyright "The Aeroplane and Astronautics"

London's Long-Haul Terminal

Passengers arriving at the new long-haul terminal go first to one of these baggage counters to check-in their registered luggage.

A few steps from the baggage reception area are the ticket desks (above) where formalities are completed before the passengers go to the first floor (below) with its restaurants and shops.

NUMBER 3 PASSENGER BUILDING, to use the prosaic official title for the new long-haul terminal building at London (Heathrow) Central, came into use last Monday, Nov. 13. Although the whole building programme will not be completed until early in 1963, the portion of the terminal already in use provides satisfactory facilities for intercontinental travellers for the first time in London since the end of the War.

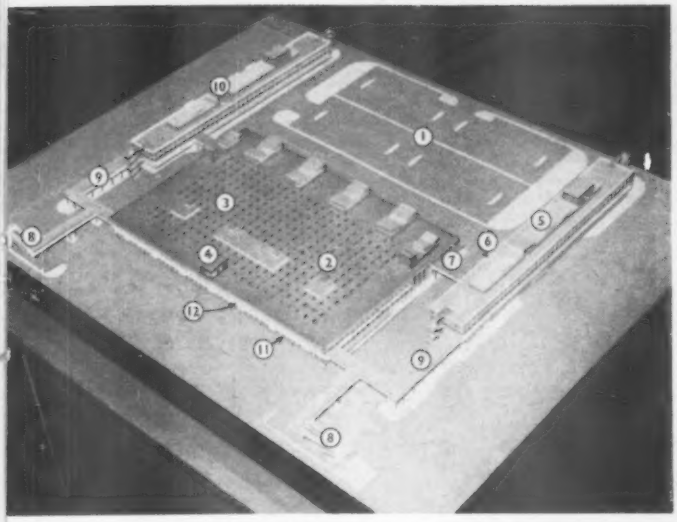
Until the next stage of the building is brought into use next spring, the long-haul terminal is being used only for departures by B.O.A.C. and its associated companies. Arriving flights of these companies are now handled in the No. 1 Passenger Building, i.e. the existing short-haul terminal next to the Queen's Building; or, if the flights have cleared Customs at Prestwick, they are handled in the No. 2 Passenger Building as domestic traffic.

Next spring, the arrivals half of the new terminal will come into use, together with additional airline counter and office space, and the remaining long-haul airlines will then move in. These will be (moving from the North Side Terminal) Pan American, T.W.A., Pakistan International, Panair do Brasil, Aerolineas Argentinas, El Al and Air India; and (from the short-haul terminal) T.C.A. The final portion of the building, to be completed in 1963, is the North Office Block.

The general layout of the long-haul terminal and its uncomplicated design are shown in the accompanying illustrations, and were described at some length in a special feature in our June 29 issue. Unlike the short-haul terminal, the new building is designed for a "trickle" flow of passengers in each direction. On the departures side, occupying half of the total floor area, passengers who have not checked in at the town terminal enter at ground level and go first to one of the baggage counters in "island" sites to check their baggage, and then go to a separate ticket counter to register their presence with the airline. Baggage is taken by moving belt straight through to the airside of the building, to be sorted according to destination and taken to the aircraft.

Passengers meanwhile go to the first floor, where there are shops, bars and restaurants (catering by Skyways Hotel) and can pass at will through the passport control to the final departure lounge, which has its own shops and refreshment facilities. Passengers from the town terminal, having checked in already, go straight to first-floor level by a separate entrance to the terminal. Only when the flight is called in the final lounge do all the passengers for that flight assemble together, to go along the airside gallery to the appropriate departure gate. The gallery, eventually, will extend the full length of three sides

A general view of the ground-floor concourse with the baggage check-in bays and ticket counters beyond.



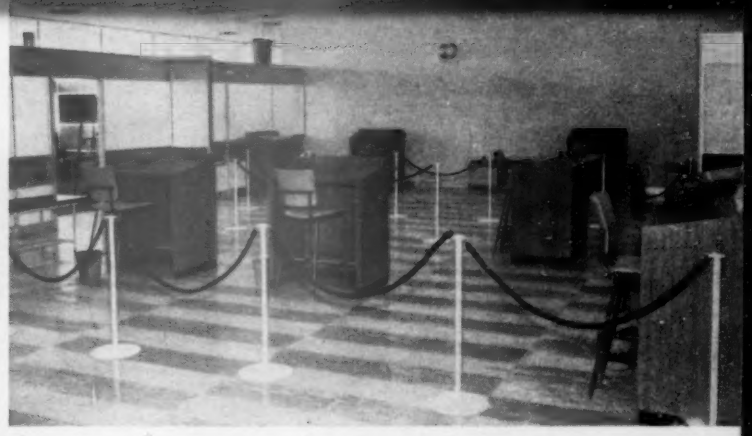
A model of the complete building. The key to the numbers is as follows: 1, short-term car park; 2, departures section; 3, arrivals section; 4, apron control office; 5, south office block; 6, coach disembarkation from town terminal; 7, bridge, office block to departures; 8, stub finger and departure gate; 9, gallery (full length of office blocks) to future departure fingers and gates; 10, north office block; 11, baggage handling platform (under gallery); 12, waving base (second floor level).

of the building. Above it on the front face is a public waving base with a clear view of the airfield and also, through glass, into the final departure lounge.

Few Customs checks are now needed for outgoing passengers. Provision has been made for spot checks of baggage, when required, at each of the island sites where baggage is checked-in. Similarly, a Customs check can be made as passengers pass through the immigration control point leading to the final departure lounge. The Customs hall for incoming passengers will be on the ground floor of the building, in the portion to be opened next spring.

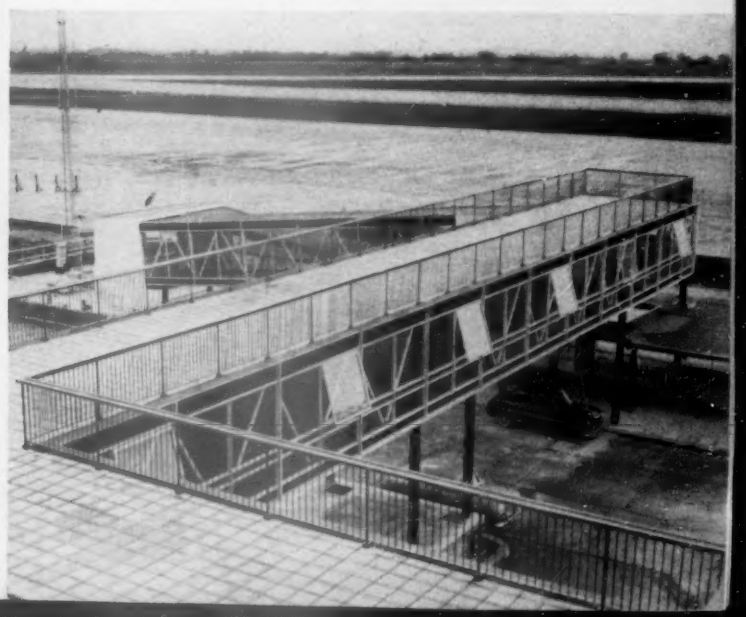
When work on the surrounding aprons is finished, there will be 30 aircraft stands, most of which will be some distance from the face of the building. Coaches will therefore be used between aircraft and terminal gates; these are new vehicles originally designed for the Ministry and taken over by B.O.A.C. Ultimate development of the building calls for full-length fingers to be built from the existing stubs and also from the rear corners of the south and north office blocks.

Photographs copyright "The Aeroplane and Astronautics"



The "frontier," for outward immigration check and Customs check (if required). Entrance to the final departure lounge is on the left.

The final departure lounge (above) has the customary souvenir shop and bookstand and refreshment facilities. From here, the passengers go by way of the gallery to the stub finger (below) through which all departures are made at present.



Air Transport . . . .

Air Operator's Certificate Holders

THIRTY-TWO private air companies were listed as having air operators' certificates at the end of last month. These certificates are required by any operator using aircraft of more than 5,000 lb. gross weight for public transport. The list was given by the Minister of Aviation in a written answer in the House of Commons on Oct. 23, together with details of the numbers and types of aircraft used by each operator.

The full list is as follows:—

Air Couriers (Transport), Ltd. (2 Rapide); Airlines (Jersey), Ltd. (8 DC-3, 4 Heron, 2 Herald); Air Links, Ltd. (2 DC-3); Air Safaris, Ltd. (6 Hermes, 8 Viking); Autair (Luton), Ltd. (3 DC-3); B.K.S. Air Transport, Ltd. (2 Viscount, 4 Ambassador, 3 DC-3, 3 Bristol 170); British United Airways, Ltd. (including associated companies) (6 Britannia, 2 DC-6, 5 DC-4, 9 Bristol 170, 7 Dove, 3 Heron, 3 Rapide, 11 Viscount, 3 DC-3, 5 Westland S-51, 12 Westland S-55, 18 Hiller, 1 Consul); Cambrian Airways, Ltd. (2 DC-3); Christchurch Aero Club (1 Rapide); Claydon Aviation, Ltd. (3 Viking); Cumberland Aviation Services, Ltd. (1 Rapide); Cunard Eagle Airways, Ltd. (including associates) (3 Britannia, 3 DC-6, 2 Viscount, 3 Viking); Dan Air Services, Ltd. (4 Ambassador, 4 York, 2 DC-3, 3 Bristol 170, 2 Dove); Derby Aviation, Ltd. (6 DC-3, 1 Marathon); East Anglian Flying Services (3 Viking, 2 Bristol 170, 6 DC-3, 2 Dove); Executive Air Transport, Ltd. (1 DC-3); Hampshire Aeroplane Co., Ltd. (1 Rapide); Lloyd International Airways, Ltd. (1 DC-4); Mayflower Air Services, Ltd. (1 Rapide); Maitland Drewery Aviation, Ltd. (3 Viscount); Mercury Airlines, Ltd. (2 Heron); North-South Airlines, Ltd. (1 Heron); Portsmouth Aero Club, Ltd. (1 Rapide); Silver City Airways, Ltd. (including Manx Airlines) (15 Bristol 170, 11 DC-3, 4 Hermes, 1 Dove); Skyways, Ltd. (including Skyways Coach Air, Ltd.) (4 Constellation, 7 York, 4 DC-3); Starways, Ltd. (3 DC-4, 3 DC-3); Tradair (2 Viscount, 7 Viking); Trans-European Aviation, Ltd. (2 Constellation, 1 Bristol 170, 2 Rapide); Tyne-Tees Air Charter, Ltd. (2 Dove); Westair Flying Services, Ltd. (1 Rapide); Westpoint Aviation, Ltd. (2 DC-3); World Wide Aviation, Ltd. (2 DC-4).

A comparison of this list with a similar one prepared by the Ministry earlier this year shows only one deletion—the name of Overseas Aviation. In the light of recent developments (see our issues for Nov. 2 and Nov. 9) it is to be anticipated that other names will disappear from the list in the near future, among them Claydon Aviation, Ltd. We also understand that Christchurch Aero Club has relinquished its certificate.

The most recent list includes six names which have been added during the past few months. Apart from the Hampshire Aeroplane Co., Ltd., and Portsmouth Aero Club, Ltd., these are Lloyd International Airways, Mayflower Air Services, North-South Airlines and World Wide Aviation.

Four other companies have, or have applied for, air service licences. These are Black Isle Air Services, which (see our previous issue) does not need an A.O.C. to operate a Piper Apache; Caledonian Airways (Prestwick), Ltd., which has not yet started operations; P. and A. Campbell, Ltd., which has applied for a series of hovercraft services; and Scottish Aviation (Prestwick), Ltd., which holds, but does not operate, a transitional licence.

OPtional Reading—20

BEFORE looking at specific accidents in the light of the methods shown in last week's table, it would be a good idea to consider the estimated probabilities in relation to general experience—just to see if they make sense. Unfortunately this is not easy to do, not because of the fault of the table but because many of the accident and incident investigations show so much preoccupation with the visual aspects of the landing that they give no clue to the approach speeds, acceleration or gust effects. However, we are not lacking in material showing the gross incidence of undershoots and heavy landings. Here, for example, is Kirchner's list (see OPtional Reading 15) of undershoots, by category, occurring to civil aircraft in the years 1954-58:—

A1.	Crashed and came to rest within one mile of the threshold	8
A2.	Operating contact following IFR conditions ...	20
C.	Undershoots involving contact with the ground just prior to reaching the threshold	40
E.	Flight control upsets due to cross-winds, down draughts, overriding winds, wind shifts, turbulence, rainstorms	40
F.	Stall-outs in the vicinity of the threshold ...	31

Bring these up to date and add the record of incidents (as opposed to accidents) from sources such as the F.A.A. Daily Mechanical Reports and one fetches up with a pretty formidable list. So, before anyone shoots down the probability figures as mythical, I suggest he goes through these and similar sources.

And for those who say that it is primitive to use stalling speed as a base, I would agree, but at the same time add that I would be happy to rework the figures using angle of attack or lift coefficient—*just as soon as the pilot is provided with an angle-of-attack instrument or a lift meter*; until then I stick to "the speed at which the aircraft falls out of the hands." Looking at the Lightnings touching down in their superb series at Farnborough, I can see the things fall out of the hands of the pilots; it is a meaningful phenomenon to me. But for the pilot manœuvring a modern jet near the ground (on take-off, do not rotate too early, too late, too much, too little; on landing, do not pull the nose up too soon, etc., etc.), angle of attack, without an instrument to measure it, is all but meaningless—just a science fiction discussed in design offices.

About a year ago a venturesome American operator installed the SCAT (Speed Condition Approach/Take-off) of the Safe Flight Instrument Corporation, which, embodying lift and acceleration measurements and presenting them in the cockpit in the form of a fast/slow indicator, looked a very promising instrument. But the last I heard of it was that its readings for the Mush Point did not agree with those of the aircraft manufacturer and it was sent back for a course of brain washing. Perhaps the tolerances had been set on the basis of the 1*g* stall!

Turning now to specific accidents against which to test our theories, I find three undershoots which stand out in my mind, the Constellation 749 at Singapore on March 13, 1954, the Electra at La Guardia on Sept. 14, 1960, and the Boeing 707 at Nairobi on Oct. 29, 1960. The first two can be taken as examples of a flat approach, in which case the gust effect is high and the *g*-loads low; in the case of the 707 I cannot find from a quick thumb-through of the verbatim report (about 2 in. deep of foolscap) any definite figure for the wind or gust, but the description of the descent seems to indicate a moderate or high *g*-loading during the flare.

There is space this week only for the 749. Here, using the quoted weight of 83,227 lb., an approach speed of 100 kt. and a wind of 20 kt., and assuming a *g*-loading of 0.2, together with standard deviations, slipstream and buffet as in last week's table, the probability of encountering the stall is 3×10^{-4} and the buffet, 3.17×10^{-3}.

Now both of these figures indicate that some day a pilot making a flat approach in windy conditions at a speed 1 kt. above 1.3Vs (in this case 99 kt.) and applying moderate *g* would land short—not every time, but quite often enough to notice—i.e., more often than 10^{-4}, which itself is an absolute minimum. And he would do this without any failure on his part to make or maintain the intended threshold speed. It is simply a case of that modernized version of the blind Fury, Nemesis, in the form of the law of probability, cutting in sharply and exacting its victim.

I am not saying that there was no pilot error in this accident. A flat approach of the type described has never been regarded as good technique; but there was at the time no generally accepted rule for gust allowance and an approach at 1.3Vs would look safe so far as one could tell from any figures appearing in the Flight Manual.

A pity that the Commissioner did not explore, or at least did not comment on, this aspect, especially as the report of the ICAO Standing Committee on Performance had been out for a year and showed that the 749 was, on the basis of observed results, on a sizeable batch, operated to a threshold-to-stall ratio distinctly less than the average (Doc. 7401 pg. III—79) and was also dropped on the runway at a speed closer to the stall than average (*idem* pg. III—71). Indeed, looking at the figures given in these references suggests that the 749 might have been flown regularly to the same approach speeds as the much lighter L-049. The average threshold speed is 1.27Vs!

As mentioned in OPtional Reading 16, I do not wish to make any great play of individual accidents and I would not now be pulling old skeletons out of cupboards unless there were still some general lessons to be learnt from them. That the lessons have not been learnt from the above case is evident from the fact that almost identical accidents—that is, accidents showing a slow, flat approach—are occurring in the 1960s just as they did in the 1950s. In the earlier years there was some excuse in that the various contributory factors with which we have dealt were unassessed; for example, in the matter of gust effect the pilot was simply expected to use his judgment in windy conditions. With present-day knowledge this can no longer be supported and yet we see some companies without clear operational rules on these matters and others which would not have had them had not the *aircraft manufacturer* put them forward.—C.C.J.

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Belvederes in Tactical Service

AS the first twin-engined helicopter to enter service with the R.A.F., the Westland Belvedere represents an important addition to the mobility and strength of No. 38 Group, Transport Command. This unit, under its A.O.C., Air Vice-Marshal Peter Wykeham, D.S.O., O.B.E., D.F.C., A.F.C., is itself something of a departure from normal R.A.F. practice, in being a self-contained tactical force with its own short- and medium-range transport and strike elements for the close support of the Army in the field.

It is concerned, in particular, with the operations of the U.K.-based Strategic Reserve, which it would accompany on many of the "fire-brigade" types of venture in various parts of the World, in parallel with the support provided by the locally based air force elements in the main overseas theatres. To maintain the effectiveness of all the supporting R.A.F. units, the first Belvedere formation, No. 66 Squadron, will leave its current base at Odiham next year, to operate within the Far East Air Force, and another is scheduled to be formed and sent to Aden, for Middle East operations. A third Belvedere squadron will remain at Odiham to serve with No. 38 Group.

The next unit to receive these big twin-engined helicopters will be No. 72 Sqn., which is to be formed at Odiham on Dec. 1, 1961. This Hampshire airfield, which is also the H.Q. of No. 38 Group, thus retains its long-established tradition of army co-operation, which predates its function as a base for the Lysanders accompanying the B.E.F. in 1939. No. 38 Group also includes within its orbit the airfields of Abingdon and Colerne, and is soon to add Benson and Waterbeach, to accommodate its tactical aircraft strength of Beverleys, single and Twin Pioneers, Belvederes and Whirlwinds.

The recent S.B.A.C. show at Farnborough illustrated the fighter support given to 38 Group operations by Hunter F.G.A.9s, which are now being added to the unit's strength by the transfer of two squadrons from Fighter Command. On the transport side, the Group is also in the process of receiving the first A.W.660 Argosy C Mk. 1, and the first Gnome-Whirlwind C Mk. 10 helicopter arrived at Odiham on Nov. 4, to replace the piston-engined S-55s of No. 225 Sqn.

These new Whirlwinds will meet the lower level of No. 38 Group's requirements from its helicopters of a 4,000-6,000 lb. payload, while the higher lift figure is just within the Belvedere's capability. Up to 10,000 lb. lift is required from the fixed-wing aircraft of No. 38 Group, which is also seeking a smaller transport in the 4,000-6,000 lb. category. These payload figures are governed partly by the type of load to be lifted for the mobile Army Reserve, which depends on Land Rover-sized vehicles and guns of up to 105-mm. calibre for its fighting power, and partly by the optimum size of aircraft or helicopter determined by numerical and budgetary considerations.

Since there is never a great deal of money to spare in our military appropriations, economy is one of the main watchwords within 38 Group, and procurement is governed to a large extent by the promised potential of flexibility. From that point of view, according to Air Vice-Marshal Wykeham, "any helicopter is a good helicopter," and the Belvedere has been received by the R.A.F. with considerable satisfaction.

The type has also entered service with commendable speed, and by combining initial Service trials with tactical exercises, with which No. 38 Group is unprecedentally prolific, several months have been saved in bringing the Belvedere to an operational level. The first three pre-production Belvederes were handed over to Sqn. Ldr. J. R. Dowling, O.C. Service Trials Unit, at the Westland base at Weston-super-Mare, in October, 1960, and after intensive flying from Odiham, including participation in the recent exercises in Germany, No. 66 Sqn. was formed on Sept. 15, 1961.

It was, of course, based on the Belvedere Trials Unit, and retains the same C.O. Its six aircraft, however, are to full production standards and differ from earlier Belvederes in having servo-boosted controls, metal rotor blades, a slightly modified tail unit and low-pressure tyres to facilitate operation from any type of surface. Power is supplied by two Napier

THE AEROPLANE and ASTRONAUTICS
NOVEMBER 16, 1961

Belvederes in Tactical Service . . . .

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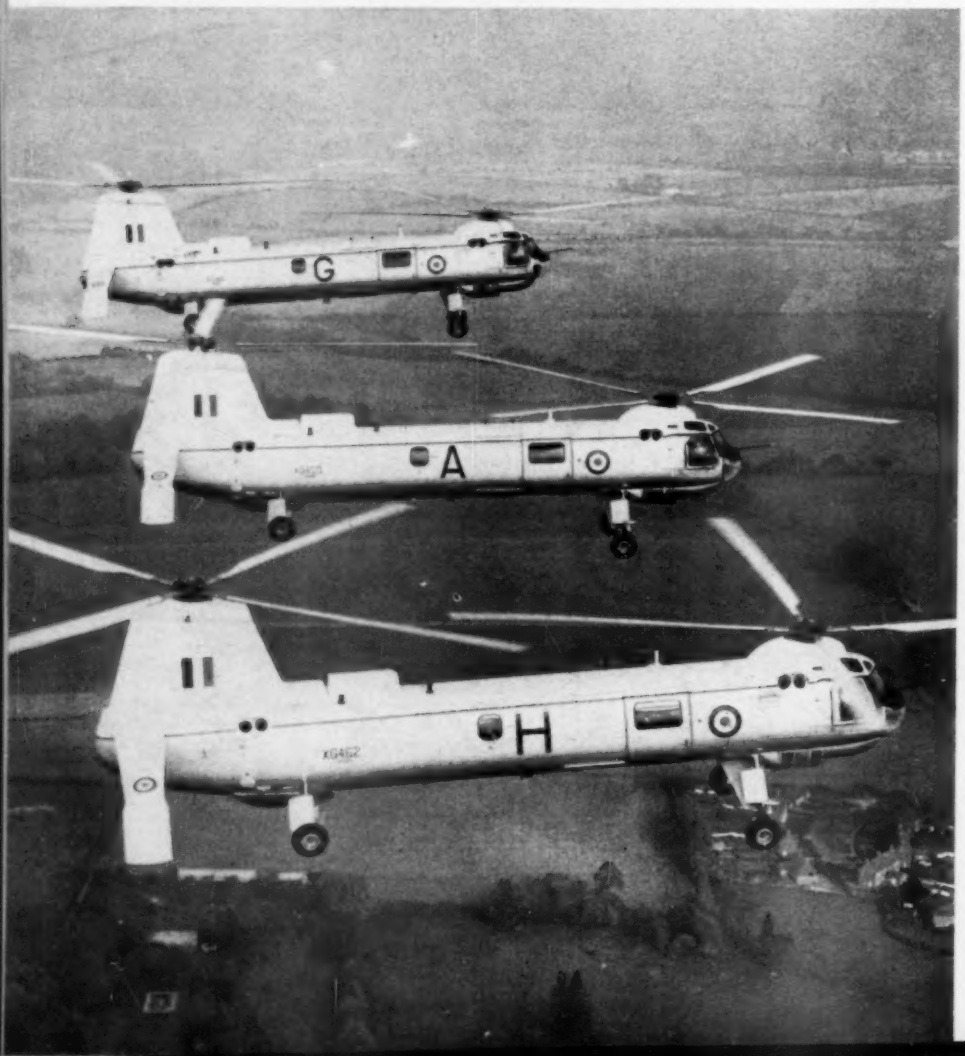
Gazelle NGa.2 free-turbine engines each with a normal output of 920 s.h.p., but with one-hour ratings of 1,450 s.h.p. and 2½ min. emergency power of 1,650 s.h.p.

Normal operating crew of the Belvedere comprises first and second pilots, plus an aircrewman/dispatcher. The type has proved very popular with the personnel of No. 66 Sqn. and, despite its size and complexity, is very little more difficult to fly than the single-engine Whirlwind. As a matter of policy, Belvedere pilots are drawn from personnel who have completed at least one tour on helicopters although, according to Sqn. Ldr. Dowling, a Whirlwind pilot could solo the larger type after about 10 minutes' dual. In fact, the Belvedere conversion course, which includes all the basic tactical applications, is only over 20 hr. flying.

Some of the jobs that the Belvedere may be called upon to perform for the Army were shown at Odiham during a recent display, which included load-lifting demonstrations of a one-ton container, a jeep and trailer, and four 1,000-lb. netted loads of water, fuel, ammunition and food by three individual helicopters. Another Belvedere demonstrated the laying of a prefabricated Mexe bridge, weighing 4,250 lb., across a river represented by the airfield perimeter track.

Eighteen R.A.F. Regiment personnel, with full equipment, deplaned from a Belvedere, which was on the ground for only



ROTOR FORMATIONS.—Above and left, the first air-to-air photographs of No. 38 Group's new Gazelle-powered, tactical helicopters airborne from R.A.F. Odiham. Belonging to No. 66 Squadron, these Belvederes are to be transferred next year to the Far East Air Force.

25 seconds; up to 28 soldiers can be carried under operational conditions. Each Belvedere squadron is to be assigned a number of Regiment personnel for local defence in forward areas, and such duties as driving, signalling, marshalling and hooking-up loads.

It is the function of the helicopters and the other short-range transport types of No. 38 Group to perform the intimate support of troops in the front line, by placing their supplies virtually in their hands, via 2,000-3,000 lb. "shopping baskets" in the form of net slings. This is organized by FATOC—the Forward Air Transport Operations Centre—which is one of the most advanced links in the chain of organization of No. 38 Group on its deployment to an overseas trouble spot.

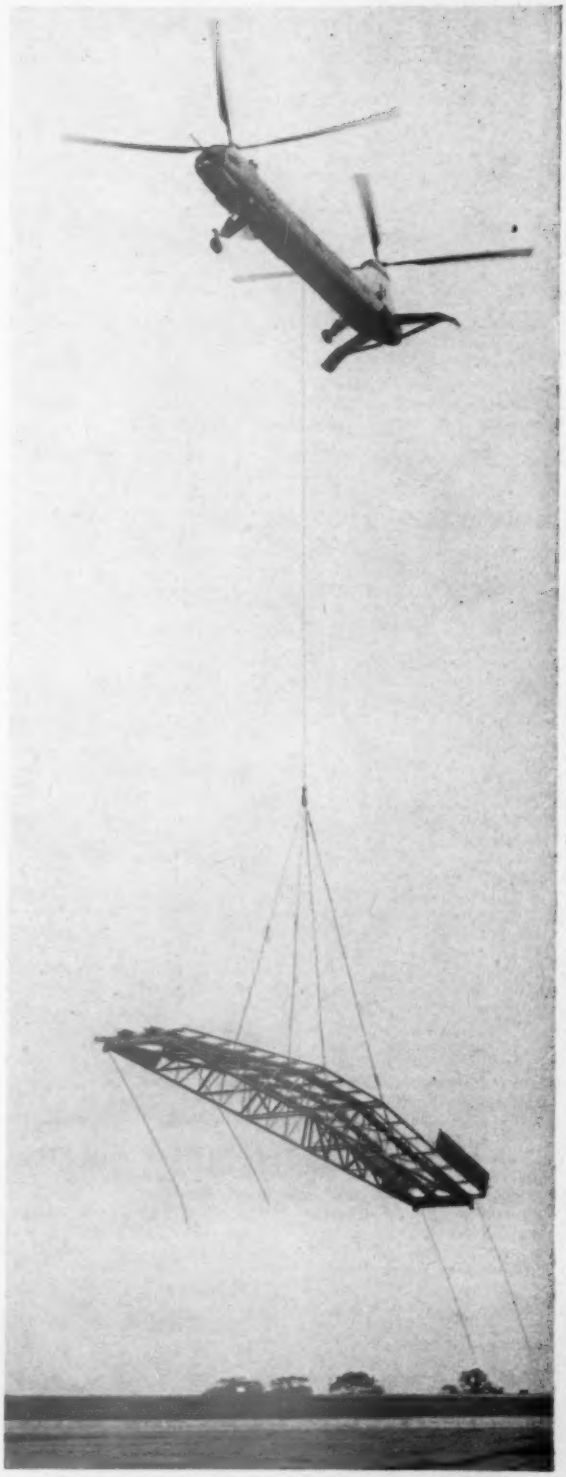
Initial launching of the Strategic Reserve is the responsibility of the long-range aircraft of Transport Command. No. 38 Group takes over the tactical logistics from that point, after its Air Support Operations Centre in the U.K. has dealt with the Army's requests. From ASOC to ATOC: the Air Transport Ops. Centre, has a joint Army-R.A.F. staff which handles requests for major support sorties such as parachuted supplies, which would be currently from the Beverley, and soon from the Argosy.

Apart from FATOC, the front-line organization includes BASOC, the Battlefield Air Support Ops. Centre, which comprises a couple of officers to advise on air strike action. With ground radio, they can handle movement of aircraft into their sectors, and pass on target direction through Forward Air Controllers, who are down virtually to walkie-talkie level. Other components within the tightly knit organization are the Mobile Ops. Teams, who seek out suitable landing and dropping zones, and Casualty Air Evacuation Units, who arrange the return of wounded personnel in the helicopters as they fly back to the airheads.

In the case of the Belvedere, the 24-ft. cabin can accommodate up to a dozen stretcher cases, or an alternative arrangement of eight stretchers, three sitting cases and a medical attendant. Slung loads of up to 5,250 lb. can be carried externally, for the flying crane rôle, with mechanical or electrical quick-release gear, while a loading winch can lift up to 600 lb.

With its 6,000-lb. maximum payload, the Belvedere has a range of 75 miles, but for ferrying an auxiliary fuel tank of 260 gal. capacity can increase the total to 820 gal., for a maximum range of 490 miles. Cruising speed can be as high as 138 m.p.h., and the Belvedere has already proven its capability for long-range operations with a record flight to Rome, and on to Malta and North Africa. A block speed of 130 m.p.h. was achieved on the initial legs of this flight.

Current order for the R.A.F. is 30 Belvederes, the production of which is now well advanced. Coupled with its new Whirlwinds, the Argosies, and existing fixed-wing STOL aircraft, No. 38 Group has been given a flexible and economical airlift capability by the addition of its Belvedere squadron. As a balanced tactical force for combined operations it should add considerably to the British political deterrent with the mobility it confers on the Strategic Reserve.—J.E.F.



BRIDGE CARRIER.—In the flying crane rôle the Belvedere can carry slung loads of up to 5,250 lb., with mechanical or electrical quick-release gear, while a loading winch can lift up to 600 lb.

SQUADRON LINE-UP.—Left, six Belvederes of No. 66 Squadron, the first operational formation to receive these large twin-engined helicopters, lined up at R.A.F. Odiham. The second Belvedere squadron will be No. 72 which is to be formed on the first of next month.

The Fighting Services

R.M.A.F. Affairs

WITH over 60% of its personnel seconded from the R.A.F. and its work entirely air transport support, the Royal Malayan Air Force is probably unique among World air forces in being a non-combatant Service.

One reason for this is that the R.M.A.F. has a full-time job on its hands coping with the situation created by the continued presence of Communist terrorists along the northern border of Malaya. It works closely with Malayan troops and police in combating this menace and it operates from 15 airfields and inland strips.

At present, the R.M.A.F. transports troops and supplies to jungle forts; it plans eventually to take over supply dropping by parachute now done by the R.A.F. Valetta force from No. 52 Squadron based at R.A.A.F. Butterworth. No. 110 Squadron Sycamores, also at Butterworth, provide casualty evacuation service and troop lifts from forts to deep jungle.

Manpower at the end of 1960 totalled 350 but this is expected to increase to 600 by mid-June next year when the R.M.A.F. will be four years old. Present aircraft strength is 20—four Twin Pioneers, five Pioneers, two Cessna 310Fs, three Doves and six Chipmunks. By June, 1962, another 10 Pioneers will have been added, and six Provosts are expected during the year. By 1965, subject to there being no further expansion, Gp. Capt. J. Stacey, the R.M.A.F. commander, expects that over 90% of the officers will be Malayan.

Among aircrew there are at the moment 11 seconded R.A.F. pilots serving with R.M.A.F. and nine Malay pilots. Thirteen Malay pilots are completing training in the United Kingdom and four more are being trained at the R.M.A.F. Headquarters at Kuala Lumpur, where a Flying Training School was recently opened. A Technical Training School is being established at Kuala Lumpur to train a further 100 technicians for the Service.

News of the R.C.A.F.

FIRST Boeing Bomarc B ground-to-air missile for the R.C.A.F. was delivered in late October, but the Canadian Government has not yet made a decision on arming them with nuclear warheads. Indeed, so far as can be learned, no warheads of any kind are yet installed.

The Government is reluctant to make Canada the first small power to employ nuclear weapons, even for defensive purposes. Canada's leading post in condemning nuclear tests has made such a rôle doubly undesirable. Moreover, with so much Canadian industry controlled in the United States, public opinion is sensitive to any suggestion of American control, as would be the case with nuclear warheads.

On the other hand, the Service feels that a nuclear warhead is the most certain means of destroying a nuclear weapon carried in a hostile bomber. High-explosive warheads would merely destroy the aircraft, allowing the bomb to explode on Canadian soil, rather than high in the air, it is argued. The greater power of the nuclear warhead would make destruction of the bomb more certain.

Meanwhile, the first operational CF-100 all-weather fighter squadron was to start conversion to McDonnell CF-101B Voodoos at Namao, near Edmonton, on Nov. 13. It will be followed at six-week intervals by the other four squadrons. As each finishes conversion it will go into operational service with the new fighter. All conversion training is expected to be completed by April 30, 1962.

Like their American counterparts, the Voodoos will be armed with Falcon guided missiles. Until they become operational, the Royal Canadian Navy's aged Banshees will be the only Canadian aircraft with guided missiles (Sidewinders).

The 66 Voodoos will equip five squadrons to be based at Comox, B.C.; North Bay, Ont.; Ottawa; Bagotville, Que., and Chatham, N.B. They will be supplemented by two Bomarc B bases at North Bay, Ont., and La Macaza, Que. All will be controlled by a SAGE centre near North Bay, said to be the only underground (although not "fully hardened") centre in North America.

The changing views of the Air Staff can be seen from the previous strength of R.C.A.F. Air Defence Command: nine CF-100 all-weather fighter squadrons, each with about 20 aircraft and backed by large reserves.

Disbandment of the four fighter squadrons has been partly offset by the creation of two new squadrons this year, an unusual event in recent years. No. 415, a new Argus maritime patrol squadron at Summerside, P.E.I., has been operational for a few months, while No. 437 (Transport) Squadron is now being formed at Trenton, Ont. No. 437 perpetuates a wartime squadron which served overseas with Dakotas. Equipped with Canadair CL-44 (CC-106) Yukons, it will operate regular flights to the N.A.T.O. air division in Europe and to other points.

The weekly airlift to U.N. forces in the Congo has put an unexpected strain on Air Transport Command. No. 426 Squadron, which was to get Yukons, is therefore retaining its Canadair North Stars and moving to St. Hubert, near Montreal.

Contrary to recent reports, the R.C.A.F.'s surplus B-25 Mitchells have not been sold to Brazil. Two Mitchells remain in service with the Central Experimental and Proving Establishment employed on a project for the National Aeronautical Establishment, at Uplands, Ottawa.—N. A. MACDOUGALL.

Hovercraft Possibilities

AN "inter-Service hovercraft trials unit" is being set up at H.M.S. "Ariel," the Fleet Air Arm airfield at Lee-on-Solent. The aim of this unit will be to provide information to assist in determining the possible employment of hovercraft for military purposes, and also the formulation of staff requirements.

The nucleus of the trials unit has already been formed and the slipway and airfield at Lee-on-Solent are also being made available for use by experimental ground-effect machines constructed in this country.

Preliminary studies and assessments have indicated that there is a good prospect that the seaworthiness of these craft can be developed to such an extent as to enable them to be used satisfactorily in operational conditions. Possible rôles could include anti-submarine and amphibious warfare and the logistic support of the Army. They might also be employed in air-sea rescue operations.

So far as the Admiralty is concerned, there is now no confusion about the place of the hovercraft as a form of transport. They will be commissioned as a ship with "a coxswain as driver."

TURBINE POWERED.—Six Gnome Whirlwind Mk. 10s were due to be delivered to the R.A.F. last week. Above, Flt. Lt. W. H. Johnson accepts the first of these turbine-powered helicopters from Mr. E. C. Wheeldon, Westland joint deputy chairman and managing director, at Yeovil prior to flying it to R.A.F. Odiham (left) to join No. 225 Squadron.

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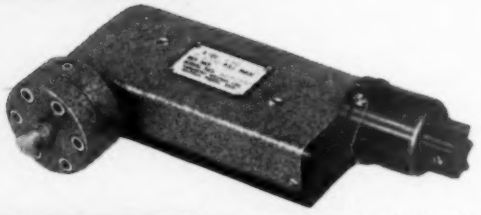

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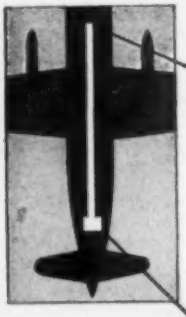
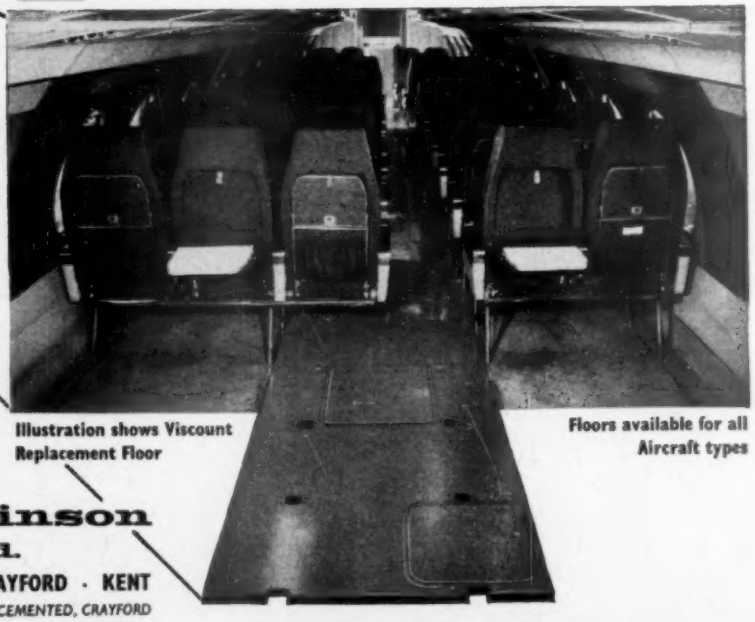


If you have the AIRCRAFT we have the FLOOR . . .



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Dilemma in Two Dimensions

Speculation about NATO's V/STOL *strike fighter by* DARYL MAY

BY the end of this year about a dozen different companies will have submitted proposals to NATO for a V/STOL strike and reconnaissance fighter to meet specification BMR-3. Already it is clear that the specification is going to result in as much, or more, controversy than has ever surrounded the selection of an aircraft for NATO. More companies from more countries have submitted more proposals than in the past; and as these proposals are for the most technically demanding specification ever, it is of the utmost importance to each country that it should have a finger in the pie. The result is likely to be controversy on a scale that even the selection of the Starfighter could not rival.

The actual requirements of BMR-3 are not likely to be released for a decade or more. But even at this early stage, enough details are known to form an idea of the type of aircraft required. *Aviation Week*, an American contemporary, reports that the specification calls for a minimum sea-level speed of Mach 0.92, while other reports point to a requirement for *true* VTOL capability, with STOL as an additional advantage for overload ferrying.

The relatively low sea-level speed called for is a puzzling anomaly, as this requirement would seem to be completely fulfilled by the Hawker P.1127 in its present form—and this aircraft will have been flying for over a year before proposals for its very existence (in the form of BMR-3) were to have been submitted. Clearly then, the sea-level speed stipulated is only a minimum and the successful contender will have a speed at this altitude well above Mach unity.

This is only one of a number of points which suggest that BMR-3 is a very loose specification which leaves many of the operational parameters to the decision of the designers. The question of powerplants has not been made clear in the specification and so some proposals feature lift engines and conventional engines, others have lift/thrust engines and yet others a mixture of the two systems. Thrust seems to vary in the ratio 1 : 2 between different proposals; in short, the requirements laid down in BMR-3 are so flexible they do not point to any rigidly defined weapons system.

At first sight this may appear to be an advantage; observers point to the fact that a loose specification means that much of the work already done on the P.1127 and other projects will not have to be scrapped. It has also been said that manufacturers know what the air forces want better than the air forces themselves.

Although both these points are probably true, there are other factors which are not so advantageous. It is absolutely clear that NATO has little or no idea of what type of VTOL aircraft is necessary and prefers to put the responsibility in the hands of the manufacturers, in effect procrastinating a decision to the time some months from now when the final choice has to be made.

This does not mean that when the decision is to be made NATO will be any clearer as to what aircraft is required. It does mean that, instead of deciding what aircraft best fits the requirements, NATO will be deciding what the best requirements are. With concrete proposals from the design teams already in hand, it is going to be very difficult for representatives of the various NATO countries to be impartial in their selection. It would have been far better for the representatives of member countries of NATO to have made their decisions (always a matter of opinion in the case of writing a specification) before the aircraft were at a stage where the decisions could be construed as being partial.

The obvious thing to do is to delay BMR-3 until it is clear just what the requirements of a VTOL strike fighter are. By ordering a few squadrons of Hawker P.1127s now and delaying BMR-3 until about 1964 (service in 1968), NATO would have been clear as to what VTOL entails operationally, and until that time would have a good weapon in the P.1127. That this should be done is further supported by evidence that weapon delivery at sea-level is unlikely to be possible supersonically, even from a supersonic BMR-3, and that the P.1127 is, therefore, as good operationally. Perhaps the glamour of supersonics is proving too much of a temptation.

BMR-3 is now a *fait accompli*. So is the fact that the decision is going to be an absolute hotch-potch of power salesmanship on a political level. One look at the list of contenders reveals that few manufacturers have dared enter the field without mustering as much international support as possible. Instead of BMR-3 being a specification calling for a sound aircraft technically, it is so vague that manufacturers have had to gird themselves politically—a fact unlikely to benefit the aircraft as a fighting weapon whatever lip service may be paid to international co-operation.

First on the list is a Hawker proposal, reportedly designated P.1150. Powered by a single Bristol Siddeley lift/thrust engine, probably an immediate development of the Pegasus, it is to be developed and produced jointly by Hawker and Focke-Wulf following an agreement between the two companies which was subsequently ratified at government level.

Now Focke-Wulf is just about the smallest of the German aircraft companies with a work force of only about 1,000. Since the War, the company has not produced a single powered aircraft to its own design. All this hardly suggests that Focke-Wulf is going to be much help in either the design or the production of the P.1150.

Republic are co-operating with Fokker to produce a supersonic variable-geometry design powered by a Bristol Siddeley BS 100 lift/thrust turbofan said to be an engine similar in concept to the BS 53 Pegasus, but giving twice the thrust. Just how keen Republic were to co-operate with Fokker can be got from the fact that they went to Hawker first, but Hawker decided that a link with a German company would be preferable. There is no doubt that the Fokker-Republic design will be a good one—particularly as Republic have in the F-105 Thunderchief the finest strike aircraft in service anywhere—but whether international co-operation will improve their design is another matter.

Short Brothers and Harland has announced its co-operation with Lockheed to produce a VTOL variant of the Starfighter. This must stand a good chance in view of both Short's experience with the SC.1 and Lockheed's success in getting the Starfighter accepted as NATO's front-line fighter.

Other manufacturers are relying on the use of a foreign powerplant to make their designs politically suitable. A Dassault-Sud venture is to use Rolls-Royce RB162 lift engines, so is a proposal from Messerschmitt, Heinkel and Bölkow. The Fiat G.95 is also to use British engines. In fact the only companies to submit designs not featuring a degree of international co-operation are Bell and Ryan. Even this is not certain as both these companies have done work on VTOL designs which had British engines. Their positions are unclear at the moment.

The whole BMR-3 affair is going to be a dilemma in two fundamental dimensions; and this is not a reference to the fact that it is a VTOL aircraft in question. The dimensions are technical and political and both are going to play their parts in the final choice.

Only one thing is virtually certain—the powerplant will be British. But even this might be a factor to influence a choice of an other-than-British airframe. Also in the picture to complicate matters further is a requirement for a V/STOL freighter under specification BMR-4. The country which gets a contract for this aircraft will be at a disadvantage in BMR-3.

It is pertinent in the midst of these deliberations to stop and consider what the Russians think about all this. It is the writer's guess that they are chuckling merrily over the political nonsense which may give NATO an inferior product. So the sooner NATO chooses its equipment on purely technical grounds the better.

Somehow Britain might come out best that way, particularly in anything to do with VTOL.

No superlatives are good enough to describe Hawker's P.1127. But, Daryl May asks, has a childish craving for supersonic speed put it out of the running?

Soviet Nuclear and Rocket Policy

LAST WEEK, we had occasion to refer to the speech by Marshal R. Ya. Malinovsky, the Soviet Defence Minister, before the 22nd Communist Party Congress. A major part of his address was devoted to the Soviet doctrine on Modern War as discussed by Mr. Khrushchev at the fourth session of the Supreme Soviet in 1960. The view was expressed that should a World war be unleashed by the "imperialist aggressors," it would certainly have a rocket and nuclear character; that is, a conflict in which the principal means of destruction were nuclear weapons and the principal means of delivery were rockets.

The Marshal stressed that such a war would start differently than past wars and be conducted in a different manner. The use of atomic and thermonuclear weapons, with the unrestricted possibilities of delivering them with the help of rockets to any target in a calculated number of minutes, enabled one to achieve decisive military results at any range and over a vast area.

The targets of crushing nuclear attacks, it was argued, would be formations of the enemy's armed forces, industrial and populated centres, communications—everything, in fact, which helped the conduct of the war. A future World war, if it could not be prevented, would have a destructive character such as had never been seen before. It would bring to their doom hundreds of millions of people and whole countries would be turned into lifeless ash-covered deserts.

"Although in a future war the decisive action will belong to the rocket and nuclear weapons, all the same we conclude that final victory over an aggressor can only be achieved by means of the combined efforts of all branches of the Services and arms.

"This is why we give attention to the perfection of all types of weapons, to train our forces to use them skilfully and to achieve a decisive victory over the aggressor. We also consider that, under present conditions, a future World war will be fought, in spite of the huge losses, by massive armed forces many million strong.

"The presidium of the Central Committee of the Communist Party and the Soviet Government have demanded, and are demanding, that we should give special attention to the early period of a possible war. The importance of this period lies in the fact that the first concentrated nuclear blows are capable, to a vast degree, of affecting the whole course of the rest of the war and lead to such losses in the rear of the armed forces as would leave the people and the whole country in an exceptionally grave situation."

If one viewed the position realistically, the Marshal went on, it must be appreciated that the imperialists were preparing just such a surprise nuclear attack against the U.S.S.R. and the other socialist countries. Therefore Soviet military doctrine concluded that the most important, the chief and priority, task of the armed forces was "to be ready continuously to repel with certainty an unexpected attack by the enemy and to break up his evil intent."

The heart of the matter was that, under present-day conditions, any armed conflict would unavoidably grow into an all-out rocket and nuclear war, if countries possessed of nuclear weapons were brought in. "Thus we must train our armed forces, the country, the whole people, for the battle with the aggressors and in particular under conditions of nuclear war."

The speech compared the U.S. figures on possible fall-out and destruction and referred to the danger to small countries.

The Marshal then discussed the progress made by the Soviet armed forces over the past five and a half years, stressing their re-equipment with emphasis on rocket and nuclear capability. After describing how the Strategic Rocket Forces were formed, he told how these forces were at readiness and how they could deliver far more weapons than "the United States defence commentators have bargained for in their studies."

He went on to say that the Strategic Rocket Forces were formed at a time when the numerical strength of Soviet forces and the command and supply structure was being reduced in size. At the same time such forces as the anti-aircraft and anti-rocket defence forces were being increased and were still being developed. The land forces, the air forces, the navy and the military air transport forces were thoroughly up to date in their equipment. The last-named would have a particularly important rôle in any future war.

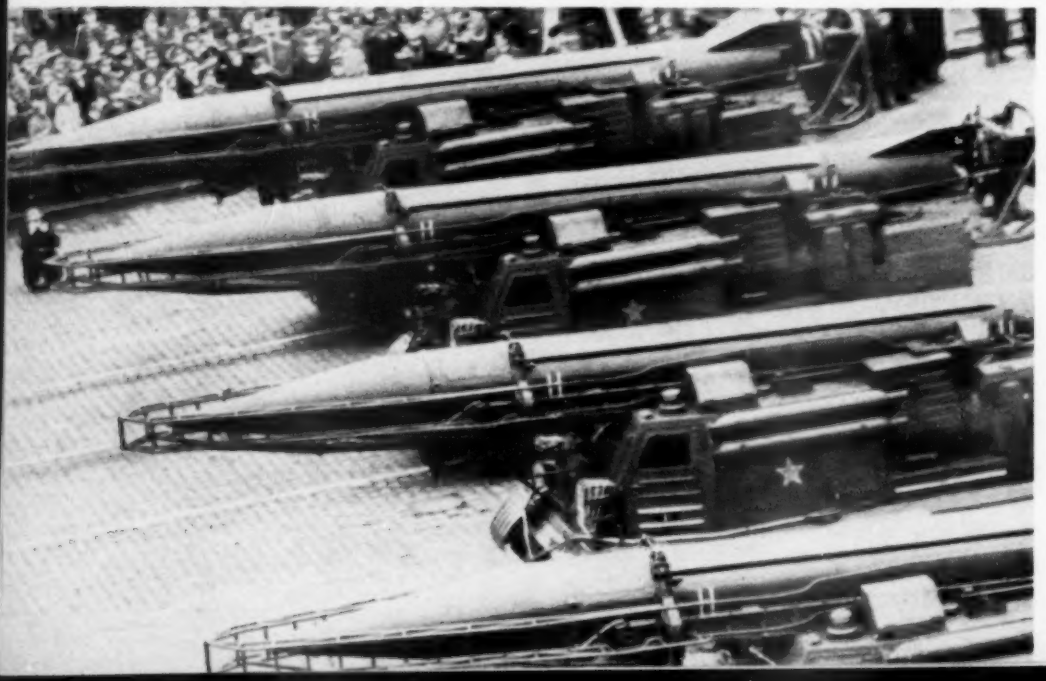
The Marshal said he had to report that production of rocket weapons had so increased that Russia now had a large surplus of rockets of different types. "The rocket forces have also reached a high standard of training. They are at permanent readiness and can successfully perform their duties. Practical launchings carried out by the rocket units in 1961 have shown convincing results.

"In the realm of intermediate-range rockets, 90% of all launchings were assessed as 'excellent and good.' So far as intercontinental-range rockets were concerned all tasks carried out were assessed as 'excellent or good.' It may seem odd, but rockets fall more accurately at long ranges than at short."

Soviet Paratroops

Marshal Malinovsky then went on to discuss the land forces, and the increase that had taken place in their fire-power and tank strength. On airborne forces, he said new aircraft were fully operational. More than 100,000 parachutists had been dropped in this year's manœuvres and there had been air landings of troops and freight. Aircraft of the airborne forces could carry vehicles, weapons and rockets. In the event of need the civil air force could quickly reinforce these air force transports.

On anti-aircraft and anti-rocket defences many changes have taken place in the PVO strategic air defence system. Surface-to-air missiles and modern fighter aircraft, working in co-operation, constitute the main strength of this force. Whereas in World War II it required an average of 400-600 A.A. shells to destroy an aircraft, the modern aircraft with a ceiling twice that of shells, could be destroyed by one or, at most, two rockets.



Four Type T-7A tactical SSMs of approximately 50 miles range, mounted on tracked vehicles. They were photographed in Moscow last week during the military parade commemorating the 44th anniversary of the Russian Revolution.

"I must make a special point in reporting that the problem of destroying rockets in flight has been successfully solved," the Marshal added.

So far as the air forces were concerned, in the past five years the obsolete piston-engined operational aircraft had been replaced by modern jet aircraft, including supersonic long-range bombers. Cannon and machine-gun armament had been replaced by rockets. In the past few years the speed and ceiling of operational aircraft had been increased 1½ to 2½ times. Aircraft equipped with stand-off missiles were being widely brought into use. Further, the air forces had raised their degree of preparedness both in co-operation with the air defence forces and in operations together with the strategic rocket forces.

The Navy had developed its submarine force, both nuclear and conventional, and this was the basis of Soviet Naval striking power. Its rocket-carrying submarines were capable of operating under the Arctic ice. Submarines operated in close co-operation with rocket-armed naval aircraft.

In the matter of personnel, Marshal Malinovsky stated that 72% of the officers of the rocket forces were engineers or technicians. The remainder of his address was concerned with political matters, including a reference to the former Minister of Defence Marshal Zhukov and his shortcomings in the political field.

What new information does this speech convey? Much of its content was foreshadowed at the Tushino air display in July, when the West received its first glimpse of Soviet supersonic fighters with missile-armament and saw the full impact of the rôle of the supersonic bomber in Soviet strategy. Nevertheless, it has been apparent that increasing reliance is being placed on the Soviet "rocket forces" with their IRBMs and ICBMs.

However, the statement that the principal means of nuclear weapon delivery in the event of global war would be by rocket is hardly true at the present time. Numerically, conventional bombers far outweigh the missiles, but doubtless the Marshal was thinking ahead.

There is the implication that the West is preparing to mount a surprise attack on the Soviet Union and the satellite states which, if this is really believed in the U.S.S.R., is a dangerous misreading of the situation.

The reference to long-range rockets being more accurate than those fired over short range makes sense only if trajectory corrections are applied from an external source, as in a radio-inertial system. The emphasis on airborne forces is interesting. One can foresee a massive rôle after a nuclear attack. The sentence on the destruction of rockets in flight is short and without frills. It does not specifically mention ICBMs, and certainly one could not conclude from this evidence that Soviet anti-missile missiles are in production. This aspect was discussed in an article last week.

Italy's Space Programme

IF Italy's newly announced programme of space research goes according to plan, a small satellite may be placed in orbit within 18 months or two years. This, of course, cannot be done without American help but the programme for 1961-63 recently approved by the Italian Cabinet is sufficiently well defined to indicate that experiments of some novelty may be attempted during this period.

The fact that Italy is to engage directly in satellite development was disclosed at a luncheon given by the Foreign Press Association in Rome on Nov. 2, when the Italian Defence Minister, Signor Andreotti, answered questions on this subject. He said the project was being prepared in conjunction with the United States Government.

It has been known for some time that the Italian National Committee on Space Research has been anxious to acquire from NASA the four-stage, all-solid, Scout for launching in some suitable location. One of the first regions to be investigated was equatorial Africa, in particular the former territory of Italian Somaliland where Italy still enjoys good relations.

More recently there has been discussion on the use of a floating launching site and according to a spokesman of the Italian Ministry of Defence, it is now proposed to build a launching platform in international waters in the region between the Red Sea and the Arabian Sea. It is understood that this area was chosen because the satellite, intended for meteorological and cosmic ray research, has to be launched from within the tropical zone.

Italy has already fired a number of Nike-Asp sounding rockets under agreement with NASA from a base at Perdas Defogu in Sardinia using personnel of the Italian Air Force. The last launching of a series of six took place on Sept. 7. The rocket reached a height of 250 km. As on previous occasions, a sodium cloud was released by the rocket as a means of obtaining data on the atmospheric composition and dynamics below the orbiting altitude of satellites.

The arrangements for this co-operative venture were outlined by Mr. Arnold W. Frutkin, the director of NASA's Office of International Programs, at the recent European Symposium on Space Technology organized by the B.I.S. He said:—

"NASA encourages and assists in the development of sounding rocket programmes by other countries and co-operates in the activities of foreign rocket teams which seek to contribute to the overall goals of space research, always of course assuming that the co-operating groups are willing to commit resources of their own to such work. In particular, NASA welcomes and encourages sounding rocket programmes of synoptic value or of special geographical significance. The upper air experiments utilizing grenades and chemical reagents are especially suitable for the initial phases of new programmes since they do not require the most complex optical or radio ground instrumentation.

"In the continuing programme of the Italian Space Committee, for example, a series of launchings was proposed to create sodium vapour clouds for the measurement of winds and temperatures in the high atmosphere. A successful test has already been conducted in Sardinia, followed by successful synoptic launchings from Sardinia and Wallops Island in Virginia.

"In this programme, the Italian Space Committee arranged for the necessary rockets, established the launching site and conducted the launchings, provided optical instrumentation to retrieve the data, and is reducing and analysing the data. NASA sponsored the Italian purchase of rockets in the United States, provided a basic launcher, and contributed the payload. Technical advice was also afforded."

Although it is possible to use the Sardinia base for rocket firings up to altitudes of some 600 miles, it is not suitable for the launching of satellites because of population density problems and the existence of a large number of sea and air routes in the vicinity.

Apart from engaging in sounding rocket and satellite research, the Italians are also anxious to participate more directly in the development of rocket hardware, and Bombrini-Parodi-Delfino has, in fact, produced useful solid-propellent military and research rockets. There is even talk of producing an Italian satellite-launching vehicle as part of a longer-term space research programme.

Meanwhile, an agreement has been reached between Finmeccanica, Fiat and Bombrini-Parodi-Delfino to collaborate on the production of missiles. The existing company SIGME (Societa Italiana Generale Munizioni Esplosiv) is to co-ordinate the work of the three groups, at the same time changing its name to Societa Generale Missilistica. Each of the three members of SGM will provide funds for an increase in the company's capital. A new board has been nominated with General Raffaelli as president.

With all these activities quietly going ahead, Italy's participation in the nine-nation European Launcher Development Organisation (ELDO) has been in some doubt. Italy was, in fact, one of the last nations to agree to full representation at the recent conference in London to agree a draft Convention for setting up the organization. It may well be that the advantages to be gained from working with other European nations in the technological field will be too great for the country.

Radar Search for "Needles"

THE U.S. Air Force stated on Nov. 3 that radar still had not found any trace of the 350 million hair-like copper dipoles which the satellite Midas IV was supposed to have distributed in orbit on Oct. 21.

A spokesman of the Massachusetts Institute of Technology said that telemetry signals received during the launching of the Atlas-Agena B carrier rocket had indicated that the "needles" apparently were ejected at the expected time and at the proper speed. "Radar search for the package is being continued in the light of the telemetry information that the package probably is in orbit as planned." The dipoles—.70-in. long and one-third the thickness of a human hair—were expected to reflect short-wave radio messages between distant parts of the Earth.

FALL OUT.—This remarkable picture taken from the B-52 parent aircraft shows the North American X-15 at the moment of its release. The rocket-powered research aircraft has recently achieved a new record speed of 4,093 m.p.h.

Aircraft Space Boosters?

FROM the Air Information Division of the Library of Congress has come the surprising conclusion that Russia may have developed a satellite launcher which employs a combination of rocket and jet-aircraft techniques. The suggestion has been advanced after a full study of Soviet technical literature published during the past three years.

According to the theory, the launcher would consist of a conventional-type step-rocket to the sides of which are attached two jet aircraft acting as lateral boosters during the early stages of ascent. After helping to place the rocket on its departure trajectory, they separate and fly back to base under pilot control. It is even suggested that this method may have been used in the launching of the heavy Sputnik on Feb. 4, 1961, and for the launching of the Soviet Venus probe eight days later.

A sketch of a rather improbable combination launcher was published in 1958. Under the best of circumstances, the relatively small thrust/weight ratio of the aircraft attachments, plus the additional drag, would scarcely merit serious consideration. There is also the question of the short time during which the jet-engines would be providing useful thrust. However, it will be recalled that Dr. G. A. Tokaty in his lecture on "Soviet Space Technology" in September (THE AEROPLANE AND ASTRONAUTICS, Sept. 28, 1961, pp. 430-433) gave it as his opinion that Soviet designers might achieve new launching vehicles by "a combination of rocket motors and jet and ramjet engines."

Russia's Target Accuracy

A TRIBUTE to the "remarkable accuracy" of the Soviet multi-stage rockets which the Russians have recently launched into the central Pacific has been paid by the commander of the Russian ships which were operating in the target area. The squadron of vessels has now returned to port.

"The accuracy of the rockets is fantastic indeed," the commander observed in a radio message reported in the newspaper *Red Star*. "This is a fact which we have witnessed and which is confirmed by very accurate measuring instruments in our ships."

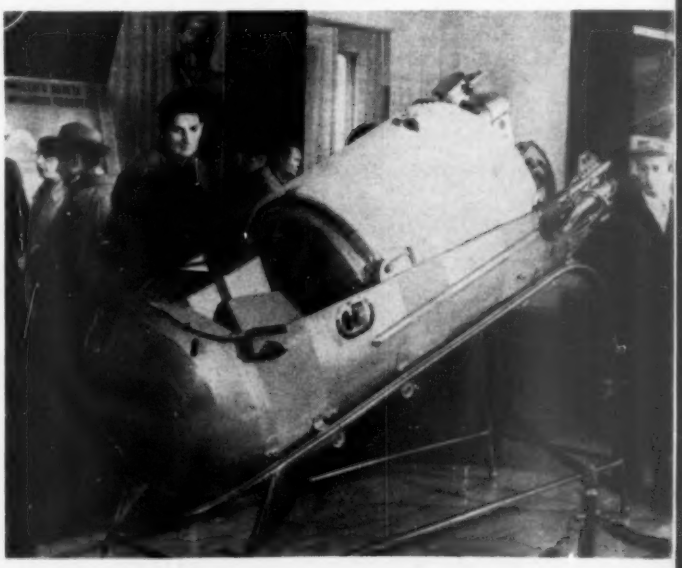
The commander claimed that all the rockets had landed accurately in the predetermined area after travelling some 7,500 miles. "We worked calmly in the target zone," he said. "We made contact with the rockets precisely at the appointed time and carried out measurements without any fear that the rockets might deviate from their course."

He added that United States ships and aircraft did not leave the target area and the Soviet ships in peace for a single moment. American planes daily "buzzed" the ships, flying "virtually a few inches above the aerials." American ships "manœuvred in such a way that they interfered with our work," he went on, "but we quietly got on with our business."

During the latest test series, the Russians claimed that eight rockets were fired, on Sept. 13, 17 and 21 and Oct. 7, 12, 15, 22 and 29, and that all hit the target area with high precision. Although there has been no hint of any failures, the long gap between the launchings of Sept. 21 and Oct. 7 may suggest troubles of some kind. In any case, it is scarcely likely that a series of launchings on this scale and frequency could have been conducted without some element of difficulty.

Nevertheless, it is a sobering thought that the Russians have found it possible to launch eight rockets, which may well be in the same class as America's Saturn C-1, within the span of 47 days. It is all the more impressive when it is remembered that Saturn is not scheduled for operational use until 1964.

First test-firing of Saturn took place on Oct. 27 but its top stages were water-ballasted dummies. NASA has now concluded that it reached a height of 84.8 miles and impacted 214.7 miles downrange "within 10 miles of the planned target."



DOG CABIN.—Visitors to the U.S.S.R. Economic Achievements Exhibition in Moscow inspect the "actual capsule" in which the Russian dogs, Belka and Strelka, were recovered after making more than 17 orbits of the Earth in Spacecraft II.

(*Continued from page 636*)

COLLISION STUDY.—The Sperry Gyroscope Co. is conducting a study, under F.A.A. contract, of human factors involved in air collision avoidance. Pilots will be watched in simulated mid-air collision risk situations to assess their ability to detect and evaluate the threat and to check their reaction times.

LONG BEACH-ROME.—On Nov. 5 an Alitalia DC-8 Series 40 (Conways) flew non-stop on its delivery flight from Long Beach, California, to Rome in 10 hr. 43 min. (average speed, 582 kt.). The aircraft was the seventh of 10 for Alitalia. The previous fastest time between the two points was 11 hr. 17 min. by a K.L.M. DC-8 Series 50 on April 22.

MERGERS ABANDONED.—T.W.A. has dropped the idea of merging with Northeast Airlines. Similarly, the joint Eastern, Mohawk and National merger proposal with Northeast has been abandoned. The C.A.B. has told the Hughes Tool Co., in effect, that it may make emergency funds available to Northeast.

DONINGTON APPROVAL.—Planning permission has been granted by the Minister of Housing and Local Government for the conversion of ex-R.A.F. Castle Donington, Leicestershire, for use as a civil airport. Five local authorities are associated in the project and £185,000 has been earmarked for necessary repair and other work. The Minister considered that there was need for the airport and that the site was operationally suitable.

NEW WINDHOEK AIRPORT.—Because the airport at Windhoek, S.W. Africa, cannot take long-haul aircraft and cannot be extended, a new airport is to be laid down about 28 miles east of the capital. The present airport has one bitumen runway (19/37, 6,000 ft.) and two gravel runways, and handles more aircraft movements daily than any other airport, other than Johannesburg's Jan Smuts, in southern Africa.

ONE OFF.—At one time development aircraft for the Comet 4 and 4B, G-ANLO is now with the Blind Landing Experimental Unit at Bedford and bears R.A.F. livery and the serial XP915.

AIRLINER BOX-SCORE

	Total airline orders	Delivered to date
A.W. Argosy	10	8
Avro 748	20	1
B.A.C. One-Eleven	16	0
D.H. Trident	24	0
D.H. Comet 4	58	56
H.P. Herald	15	2
Vickers V.C.10/Super V.C.10	52	0
Vickers Vanguard	43	34
Boeing 707	207	164
Boeing 720	118	72
Boeing 727	117	0
Convair 880	55	45
Convair 990	27	0
Douglas DC-8	172	154
Canadair Forty-Four	17	10
Sud Caravelle	145	90
Fokker/Fairchild F-27	157	116

OVERSEAS AFFAIRS.—A total deficiency of £1,300,793 was estimated by the Senior Official Receiver at a meeting of creditors of Overseas Aviation (C.I.), Ltd., in the bankruptcy court last week. He said the company failed because of lack of capital and a too-rapid expansion. In 1959 and 1960 accounts showed net profits of £9,140 and nearly £48,000 respectively.

B.U.A. HOLDING COMPANY.—Air Holdings is the name of a company set up to acquire not less than 90% of the issued share capital of B.U.A. It will act as an investment holding company and will help in the rationalization of various companies in the group.

T.W.A. ALL-JET.—Since the end of last month, all T.W.A. international operations have been flown by jet aircraft. The last piston-engined flight outside the U.S. left Cairo on Oct. 28.

LICENCE CONDITION. — The A.T.L.B. intends in future to make it a condition of inclusive tour licences that the name of the air operator and the type of aircraft to be used shall be included in all advertising for the tours in question.

TOURISTS IN ITALY.—The number of tourists arriving in Italy in the first six months of 1961 increased by 17% to nearly 7 million, but only 5% used air transport.

IMPERIAL ACCIDENT.—Of the 81 occupants, only two of the crew survived when a Constellation of Imperial Airlines (a U.S. supplementary carrier) crashed near Richmond, Virginia, on Nov. 8. The aircraft was on a charter flight carrying Army recruits and is reported to have been attempting to land with two engines stopped on one side.

News About People

CHANGES AT THE MINISTRY.—Mr. M. T. Flett has become a Deputy Under-Secretary of State at the Air Ministry, succeeding Mr. F. Wood who has gone to the Ministry of Defence to take up a similar position. Since 1956 Mr. Flett has been at the Ministry of Power as a Deputy Secretary.

B.O.A.C. DIRECTOR. — Mr. Gilbert H. C. Lee, commercial director of B.O.A.C., has been appointed to the Board of the Corporation for five years from Nov. 6.

B.A.C. COMPTROLLER.—Mr. J. E. Armitage has been appointed comptroller of the British Aircraft Corporation. He will continue, for a limited period, as commercial director of Vickers-Armstrongs (Aircraft), Ltd., a B.A.C. subsidiary.

CANADIAN PRESIDENT. — Mr. F. R. Kearns, executive vice-president, sales and finance, of Canadair, Ltd., was elected president of the Air Industries and Transport Association at the end of its annual convention in Quebec City on Nov. 1.

F.A.A. APPOINTMENT. — Mr. Fordyce W. Luikart has been appointed deputy director of the F.A.A. Office of International Aviation Service. He is to make a special survey of the Agency's foreign activities, including the potential consolidation of the air traffic control of civil and military agencies in a common system.

ELECTRONICS RESIGNATION. — Mr. E. K. Cole has resigned as a director of British Electronic Industries, Ltd. He has also resigned from the board of E. K. Cole, Ltd.

STEELS DIRECTOR.—A director of the English Steel Corporation, Ltd., and managing director of the English Steel Forge and Engineering Corporation, Ltd., Mr. W. E. A. Redfearn has now joined the board of Firth-Vickers Stainless Steels, Ltd.

ALPA PRESIDENT.—Next May the U.S. Air Line Pilots' Association will choose a successor to president Charles N. Sayen, who wants to retire within a year. Sayen will probably be retained for three months as a consultant.

NATIONAL PRESIDENCY. — Mr. George T. Baker has resigned as president of National Airlines, but remains chairman and chief executive. He is succeeded by Mr. Robert E. Wieland, his nephew.

EDUCATIONALIST.—Mr. A. M. Dobson is now education officer of Vickers-Armstrongs (Aircraft), Ltd.

COMING OF AGE.—To mark the 21st anniversary of the establishment at Luton Airport of D. Napier and Son, His Worship the Mayor of Luton, Ald. G. L. Matthews (left), recently received on behalf of the Corporation a pair of silver candelabra from Napier's general manager for Luton, Mr. C. L. Cowdrey.

General Aviation Prospects

HAVING been invited to give this year's Sir Henry Royce Memorial Lecture before the Derby Branch of the Royal Aeronautical Society, Mr. Peter Masefield fulfilled his obligation by assembling a long and comprehensive survey of civil aviation and presenting an appraisal of its future. Some of his many interesting talking points concerning commercial air transport affairs were given on page 622 of last week's issue. Here we include more extracts from his written paper—with particular reference to his remarks on "general aviation," which he defined as all categories of civil aviation other than scheduled and non-scheduled commercial air services.

By way of giving perspective to the picture as a whole, Mr. Masefield records that in 1955 the United States produced 4,434 aircraft in the general aviation category to the value of $68.258 million (£24 million). Five years later, the number of aircraft produced had increased by 72% and in value by 95%. The average value of each aircraft went up from $15,500 (£5,500) in 1955 to $17,000 (£6,030) in 1960. Hours flown by business aircraft in America increased from 4.3 million in 1955 to 5.3 million in 1960.

From an analysis of the 78,000 active civil aircraft registered in the United States, Mr. Masefield concludes that by far the largest category of aircraft in operation is the four-seat single-engined business type. The next largest are those covering two-seat single-engined trainers, and two-seat single-engine privately owned aircraft, in almost equal numbers.

Forecasts for the Next 10 Years

He quotes some figures based on a detail market research made by the Beech Aircraft Corporation giving a forecast for the next 10 years. These figures suggest that by 1970, the 66,000 general aviation aircraft now in active service in the United States will have increased to 97,400 aircraft, i.e., by 31,400, or 47%. The biggest percentage increase is likely to be in the light twin-engine business aircraft, which Beech forecast will increase by 130% from the present 5,000 to 11,500 by 1970. The next biggest rate of increase is foreseen in the four-seat single-engine aircraft category which is estimated to have an increase from the present 32,000 to 60,000 ten years hence—an increase of 88%.

Beech also forecast an additional 1,000 heavy transport aircraft used for business aviation in 10 years' time (2,500 in 1970 compared with 1,500 in 1960)—an increase of 67%. But they suggest that two-seat trainers will fall in numbers by 12%, from 13,000 in 1960 to 11,600 in 1970.

If those forecasts turn out to be of the right order, says Mr. Masefield, the big business during the next 10 years will be the supply of some £300 million worth of aircraft, divided almost equally in value between some 6,500 light twins and about 28,000 four-seat single-engine aircraft.

A reasonable estimate of the American market for general aviation aircraft during the next 10 years, he goes on, might, therefore, be: 1,500 heavy transport and twin-turbine aircraft; 9,000 light twins; 44,000 four-seat single-engine aircraft; and 12,000 two-seat single-engine aircraft, making a total of 66,500. This adds up to an average turnover of about £65 million per annum for 6,650 aircraft per annum.

Trends in the U.K.

Turning to the position on this side of the Atlantic, Mr. Masefield points out that what has happened in the United States during the past 10 years is beginning to happen—on a smaller scale—in the United Kingdom, Europe and the Commonwealth now. There are, today, on the U.K. register some 470 active aircraft in the business and private-owner category, about 150 of which are now of American origin. There are, in addition, some 335 aircraft used for instruction in the light aviation field and 200 other "general aviation" types. This adds up to 1,005 aircraft in all.

It is reasonable to expect that the number of business aircraft in the United Kingdom will at least treble before anything approaching a comparable level of acceptance of business flying to that which exists today in the U.S.A. is reached. Such a conservative estimate would give a "floor" of about 1,500 business and personal aircraft in the United Kingdom—and such a position might be reached by 1967. Of these, Mr. Masefield forecasts, 500 will be light twins and 1,000 will be four-seat single-engine aircraft. By 1972, these totals he expects to rise to 1,000 and 2,000 respectively.

In addition, there are the two-seat private and civil training aircraft. These Mr. Masefield expects to increase at a gradual rate from 335 today to, perhaps, 425 in 1967 and 500 in 1972. "Others" may go up from 200 in 1962 to, perhaps, 250 in 1967 and 300 in 1972. This brings the total, under the three headings, from just over 1,000 today, to 2,175 (+115%) in five years' time and to 3,800 (+164%) in 10 years from now.

There is a very big export potential for British aircraft in addition to the home market. Such an export field exists in the Commonwealth, in Europe, and in both North and South America. If the right types are produced in this country export orders are likely to exceed home demand by a substantial amount.

The bulk of the potential is, naturally, in business aircraft. The upsurge of this class of aviation is coming about largely on account of three factors:—

(a) The value of the business aeroplane as a profitable tool of management and commerce. Business aircraft are no threat to the airlines; they are in fact an adjunct to them, flying into and out of major airports to connect with scheduled services to and from more scattered centres. The business aeroplane is also much more flexible than the scheduled service—especially over comparatively short distances.

(b) The improved quality of the business aeroplane, compared with a few years ago. The business aeroplane can now offer standards of comfort and safety comparable with other forms of transport.

(c) Improved utilization and regularity as a result of the application of modern radio aids and air traffic techniques to the business aeroplane.

All this adds up to the aeroplane as a new, profitable and reliable tool of industry, the use of which is expanding greatly as it becomes more widely realized. To meet these demands, five categories of aeroplanes have to be considered:—

(1) The miniature airliner exemplified, at present, by such aircraft as the de Havilland Dove and Heron, the Beech Queen Air and—in the relatively near future—such more advanced types as the D.H.125. Price range is £40,000 to £150,000.

(2) The "limousine" twin—a type which is likely to be that used in the largest numbers for business and ranges from five to seven seats. Aircraft such as the Aero Commander, the Beech Baron, the Piper Aztec, the Cessna 310 and the Beagle 206 come in this class. Prices range from £20,000 to £50,000.

(3) The four-seat light-twin—a class which does not exist in any numbers as yet, but is likely to grow fast. It is, in fact, the Gemini replacement—and will be represented by the Beagle 218 and, doubtless, others. Price range, £4,000 to £10,000.

(4) The four-seat single-engine aircraft is the largest selling category at present. It is exemplified by the Piper Tri-Pacer, Cherokee and Comanche, the Beech Bonanza and the Cessna 175 and 182, the Mooney Mark 21, the Jodel Mousquetaire and the Beagle Airedale. Price range £3,000 to £10,000.

(5) The two-seat single-engine light tourer/trainer, which may not retain its popularity compared with four-seaters—as in motorcar experience. At present the largest selling aircraft in the World is the two-seat 108-b.h.p. Piper Colt (which replaces the former Cub). The Beagle Terrier, to be followed by the Beagle 217A, and the Morane Rallye are European examples in the class. Prices range from £2,000 to £4,000.

In addition, there may well be an expanding market for the light autogyro which seems likely to show attractions in a much lower cost category than will be possible with the more complex helicopter.

Market surveys suggest that there are between 4,000 and 5,000 aircraft to be built in these five or six categories in the

EXECUTIVE AIRCRAFT COSTS

Aircraft type	Viscount V.701	DC-3	Heron	Beagle B 206	Beech Baron	Beagle Airedale
Max. gross weight, lb. ..	60,000	28,000	13,000	7,000	4,880	2,750
Max. number of pass. seats ..	50	30	14	6	4	3
Luxury number of pass. seats	18	12	8	4	3	2
Normal cruise speed, knots	274	143	145	192	188	115
Block speed for 200 n. miles, knots	170	120	122	164	160	105
Nautical miles per annum ..	102,000	72,000	73,000	98,000	94,000	63,000
Number of landings per annum	510	360	365	492	470	315
Total "Annual costs" per annum	£122,000	£46,000	£29,000	£16,300	£12,500	£5,200
"Hourly cruising costs" per flying hour	£84	£55	£36	£18	£17	£10
"Landing costs" per landing	£18	£6	£2	£0.5	£0.5	£0.3
Total of all costs per annum ..	£181,700	£81,150	£57,900	£27,600	£23,200	£11,300
Total cost per flying hour ..	£320	£135	£97	£46	£39	£19
Total cost per aircraft mile ..	35.2s.	22.5s.	15.9s.	5.6s.	4.9s.	3.6s.
Total cost per seat mile (max. seats)	8.4d.	9.0d.	13.6d.	11.6d.	14.7d.	14.4d.
Total cost per seat mile (luxury seats)	23.4d.	22.5d.	23.8d.	16.8d.	19.6d.	21.6d.

United Kingdom during the next 10 years, allowing for continuing imports and a steady export flow.

Mr. Masefield goes on to tabulate in detail the results of an analysis of operating costs. These have been worked out, deliberately, for the highest-cost type of business flying, using professional crews; and analysing costs over a relatively low (high-cost) utilization of only 600 hours per annum and over a relatively short (high-cost) average sector distance of only 200 nautical miles.

The figures show that any of a wide variety of aircraft can be operated, in varying degrees of luxury accommodation, for a little less than 2s. a seat-mile, at full airline operating standards. These costs can be reduced to a little less than 9d. a seat-mile where there is plenty of traffic; and to a little over 1s. for the lighter types.

More significant, probably, from the point of view of a business house, is that all-in operating costs—including professional crews—vary from about £11,000 a year (£5,200 a year and £10 per hour flying) for a four-seat Airedale, to a little over £180,000 a year (£122,000 and £84 an hour flying) for a Viscount. These are all total cost figures, including general overheads and represent, in fact, the sort of costs which would be incurred were the aircraft operated to the highest standards of charter at relatively low utilization rates and over relatively short sector distances.

On the subject of air traffic control, Mr. Masefield comments that this is a direction in which education of the "Powers that Be" is sorely needed. "Up to the present," he says, "most A.T.C. thinking—in this country at least—has been in the direction of supplying the needs of the airlines. This thinking must now swing no less in the direction of general aviation, whose aircraft and flying hours will henceforward outnumber those of the airlines.

"There is need for a more realistic approach to the needs of general aviation 'off airways.' The fully equipped business aircraft can, of course, meet all IFR requirements as cogently as does a scheduled airline. But the smaller type, with adequate radio, flying under VMC conditions, mostly below 5,000 ft., requires much less cavalier treatment from A.T.C. authorities—and more understanding from airline pundits—than it gets at present. A.T.C. controllers are invariably helpful and courteous, but the general direction of A.T.C. affairs needs to be more flexible in its approach. This, I am sure, will be achieved."

F.A.I. Conference

THIS year has been memorable in the history of the F.A.I. It has enjoyed the hospitality of the warm-hearted Principality of Monaco which can proudly claim to be amongst the pioneer countries in aviation because H. Rougier in 1910 made the first flight over the Mediterranean. Now 51 years later in the Principality, the F.A.I. Gold Medal has been awarded to Major Yuri Gagarin, the first man to circle the Earth in a manned rocket.

The opening ceremony of the Conference took place in the conference hall of the Oceanographic Museum in the presence of the Minister of State for Monaco, who welcomed the delegates on behalf of Prince Rainier and paid tribute to the "pilgrims of the sky" for their inventive genius, courage and audacity in the conquest of space.

Jaques Allez, the President, expressed his gratitude to the Prince and the Minister of State and to the Aero Club of Monaco. He paid a special tribute to the secretary, Pierre Sosso, for his untiring efforts in making the Conference a success.

He outlined the activities of the F.A.I. during 1960 and defended the Federation against criticisms that have appeared in the aviation technical Press and in the national Press, who questioned the authority and competence of the F.A.I. to homologate space records. The F.A.I. has set up a special Astronautic Committee of scientists, who are expert in astronautic matters—in fact are World authorities. The committee is responsible for the rules under which astronautic records are made and it is to this committee that the performance figures of records are submitted.

One item agreed later in the committee was a strong recommendation by the President that no records should be homologated for unmanned space vehicles.

The F.A.I.'s Director-General, Mr. H. R. Gillman, presented the report on the activities of aero clubs. Gliding is particularly popular; in all countries where the sport of aviation is practised, he said, one finds a gliding club. Privately owned helicopters show very slow progress, but there is a continuance of interest in aero modelling. In parachuting it is reasonable to estimate a figure of 25-30,000 parachutists in all clubs. A new set of records has been established by the increase of height to 2,000 metres. Ballooning is largely an experimental sport; the F.A.I. last year awarded its first diploma, the Montgolfier.

At this opening session of the Conference, the Federation's medals and diplomas were awarded.

As already mentioned, the F.A.I. Gold Medal went to Major Yuri A. Gagarin of the Soviet Union for his exploit in being the first man to be launched in a manned rocket and to circle the Earth in this rocket. Major Gagarin sent a telegram of apology for not being present and Constantine Kokkinaki received the medal on his behalf.

The De La Vaulx Medal has been awarded to pilots who each broke a World record during 1960: Boris Adrianov (U.S.S.R.), speed in a closed circuit, 2,092 km./hr., on May 20; Constantine Kokkinaki (U.S.S.R.), speed in a closed circuit, 2,148.66 km./hr., on Sept. 16; Cdr. John P. Davis (U.S.A.), speed in a closed circuit, 2,237.37 km./hr., on Sept. 25; and Lt.-Col. Thomas R. Grissom (U.S.A.), distance of 16,220.36 km. on Dec. 13 and 14.

The Lilienthal Medal this year has been awarded to Mme. Pelagia Majewska of Poland for her many outstanding performances in gliding. The Louis Bleriot Medal was awarded to Raymond Davy (France) for a speed of 316.260 km./hr., in a 100-km. closed circuit, on Oct. 13, 1960, in a light aeroplane of class C-I-b.

Paul Tissander Diplomas were awarded to:—

Albert Roussel, E. O. Tips (Belgium); Frantisek Hanus, Joseph Svetinsky, Jaroslaw Meder (Czechoslovakia); Gunnar Hansen (Denmark); Kalle Jaako Temmes (Finland); René Eyraud, M. Burlaton, M. Popineau (France); Paul A. Meckle, Christian Biser, Richard Konkhe (Germany).

Charles Maurice Newton, M.B.E., Norman Jones, Frank Irving (Gt. Britain); Col. Zissis Linos (Greece); Prof. Dr. P. M. van Wulfften Palthe, Henri Hegener (Holland); Ermanno Bazzocchi, Gen. Francesco Brack Papa, Ermanildo Preti (Italy); Dusan Vlaisavljevic, Marco Persic (Yugoslavia); Mme. Irena Zabielle, Stanislaw Michniewski, Wladislaw Parczewski (Poland).

Radu Manicantide, Banica Enciulescu (Rumania); Raphael Martinez de Pison y Nebot, Miguel Ara Torrel, Fernando Batlo Canadell (Spain); Noel Marcel Weber, Arnold Degen (Switzerland); Gen. Adnan Ozsoy, Col. Tacettin Tezer (Turkey); Mrs. Arlene Davis, Martin Decker, Max Conrad (U.S.A.); Mikhail Veretennikov, Alexei Bielooussov, Alexei Loutsenko (U.S.S.R.).

A Book to Get

WINGS ON MY SLEEVE, by Cdr. Eric Brown, O.B.E., D.S.C., A.F.C., M.A., R.N. 191 pp. Illustrated. Arthur Barker, Ltd. 21s.

"WINKLE," as he is known throughout the Navy and R.A.F. as well as by those more closely acquainted with flying in the British aircraft industry, has written in his typically breezy, but factually dispassionate, manner the unique story of his flying days. He forgets to mention that he came to flying as an academic young man with an M.A.

"We had a month's survivor's leave," he casually says early in the book. In the subsequent 20 years he was the fortunate survivor many times—though that was not just luck.

Here is the man who first landed a twin-engined aeroplane, the first tricycle, the first jet, and many other machines for prototype trials on the pitching and rolling deck of an aircraft carrier, and who first experienced the high-*g* acceleration of rocket and steam catapults, as well as making the first undercarriageless landing, and many subsequent ones, with a Vampire on a short fixed rubber deck at Farnborough. I saw him perform this dicey-looking trampoline act, and was impressed by the calm discussion afterwards of this slight young man. I think that possibly we at Westland had initiated the idea of operational belly landings, though not on this particular scheme.

One of the most interesting sections of "Winkle" Brown's book deals with his flights on a great number of advanced German aircraft discovered after the War, ranging from the lethal Volksjaeger, to the rocket Me.163 and the giant Blohm and Voss 222 flying-boat. There were neither instructors nor instruction books. He had to decide how best to make dangerous flights of discovery in safety.

He gives tantalizing snippets of information on the handling qualities of these machines, yet technician and pilot will wish he could have given more—though this is not really feasible in a book of this kind designed for popular readership. Maybe it has been somewhat edited by the publisher, but it is interesting that the "Winkle" idiom persists throughout.

Typical is the unadorned, moving little story of how behaviour of the Vampire in a dive gave him the clue to Geoffrey de Havilland's end in the tailless D.H.108 Swallow, and how he simulated the procedure to reach the same disastrous point with a second Swallow. He marginally gets away with it, and writes: "It was QED. We knew our enemy. Next time we would be better prepared. That is test piloting." That is also "Winkle."—H.J.P.

Personal Flying

AMONG Piper developments for 1962 is the production of a six-seat version of the Aztec twin, the Model B. By distributing baggage stowage between a smaller rear-fuselage bay and a new extended nose compartment, cabin length for passenger accommodation has been increased to more than 9 ft. The four forward passengers are seated in individual reclining chairs, while a bench seat for a further two people extends across the full width of the rear cabin.

The two baggage compartments have capacities of 17.75 and 20.25 cu. ft. at front and rear, respectively, and can carry up to 300 lb. of load. The extended nose also accommodates radio and navigational electronics, with ready access through the baggage compartment door.

Power remains two 250 b.h.p. Lycoming O-540 flat-six engines, which give a maximum cruising speed at 75% output of 205 m.p.h. at 7,000 ft. With an f.a.f. price of $52,990, the Aztec B is no more expensive than earlier versions of this popular light twin, and its useful load is 1,900 lb. Standard navigational package offered as an optional extra comprises Motorola T12 ADF, Narco Mk. 10 360/190 channel VHF, with VOR/ILS localizer indicator, Narco Mk. V 90/190 channel VHF/VOR/ILS, and the possibility of including the Narco UDI-2 DME as well as the normal three-light marker beacon receiver.

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Great satisfaction is presumably felt within the Ministry of Aviation at the notable contribution to air safety made by its ban on all forms of aerial advertising from January 1 next. After that date, it will be illegal to perform banner-towing, sky-writing, sky-shouting or any other advertising manifestation from powered aircraft, gliders, kites and balloons, although the Ministry has considerately exempted the commercial use of toy balloons. Private owners can, if they are so disposed, carry markings indicating the ownership, the charterer (in certain circumstances) and the type and manufacturer of the aircraft and its engine on their aeroplanes without special permission from the Ministry.

SIX-SEATER. The 1962 Piper Aztec B, which has an extended nose for redistribution of its baggage stowage, offers standard accommodation for five passengers in addition to the pilot.

The new legislation will not affect many operators in this country. Sky-writing has not been practised to any extent since the pre-War days of Major Savage and his S.E.5s, the clouded skies of Europe having proved less than ideal as an advertising hoarding. Banner-towing has been continuing with one or two small operators, who will presumably fade quietly away, but in view of the claims for safety made in support of the ban, it is of interest to note that no major accidents appear to have taken place during the history of such operations.

Except for the extinction of, perhaps, one or two of the smaller outfits, the new edict will not result in much of a loss, but it is to be regretted as being symptomatic of the restrictive attitude in Government circles towards all forms of light aviation. Aerial advertising seems to have done no harm to anybody and its prohibition is to be mourned as a meaningless loss of freedom.

Gliding Notes

by Dr. A. E. Slater

ARMY glider pilots are to have a new club at Netheravon, in addition to the original Army Gliding Club which has operated at Lasham longer than any of the other clubs now established there. Netheravon will have the red-nosed T-21 known as "Rudolf" and the Olympia 419 belonging to the Army Gliding Association, which will buy the machines needed to bridge the gap between them. At Lasham the fleet will consist of an Eagle, Tutor, Skylark 2 and 3, plus any later additions, and beginners will be trained on machines belonging to Lasham Centre.

The Army's Skylark 2 will take up winter residence at the Long Mynd in mid November, and in the first week of the New Year the usual Wave Safari at the Mynd will be run by Warrant Officer Ted Stark. Among remoter Army bookings is the Inter-Services Gliding Championship, to be held from June 2-11, 1962, at Aston Down, which is not far from the Bristol Gliding Club.

Quoted in the Army Club's newsletter is a circular from the French centre at Fayence, near Nice, giving the charges in new francs as: "Haulin per min, 1.60; Glider per min, 0.20; Rescue by rd per km, 0.40; Pension 7.00; Family lodging, per person per day, 2.00."

* * *

AEROPLANE towing is now laid on by the Tiger Club on a regular basis. The Club has told the British Gliding Association that it has more than 10 pilots experienced in towing who are prepared to come to any club (subject to the airfield owner's permission if needed) and tow to 1,500 ft. for 12s. 6d. a time, or 2,000 ft. for 15s., or higher for 1s. 1d. per extra minute. The journey to or from Redhill is charged at 30s. per hour.

These towing charges are comparable with those of gliding clubs which have their own tugs, and it is remarkable that they are only about 50% higher than the pre-War cost of being towed.

* * *

IN the East German journal *Aero-Sport*, Konrad Forster complains about the statements often made, even by gliding experts, that the best thermals are to be found above bright surfaces such as sand, cornfields and *Betonpisten*, which seems to mean betony crops, though *Beton* also signifies a loud noise. One is reminded of a London Club expert, just after the War, who was approaching to land over a (then) hostile farmer's field, became mesmerized by the sight of a lot of chalk showing through the crop, threw a circle, and hit the chalk before he could complete it.

Dark surfaces, Forster says, absorb about 95% of the Sun's heat falling on them, but white surfaces only 5%, the remaining 95% being radiated away. But this only applies if they are equally dry, which they are often not; sand dries out quickly.

This thermal-producing quality of black ground was brought up at the OSTIV meeting at Madrid in 1952 by a German scientist, who pointed out that the surface air over deserts gets extremely hot because it can only rise in small quantities here and there in "dust devils." The desert is too homogeneous. So he proposed spreading black material, such as soot, over confined areas to start up really good-sized thermals; the killingly hot air would be got rid of, and the desert would blossom like the rose. He would even put a windmill, turning on a vertical axis, above each black patch, so that the thermals would produce free mechanical power as they rose upwards.

There have been many international conferences on desert reclamation schemes since then, but they were not attended by gliding people, so nobody seems to have thought of this one.

As to corn, it is not the colour which produces the well-established thermals from cornfields, but the hot air which is trapped between the stalks until there is enough of it to break away in a good-sized thermal. Dr. J. Paton, about 14 years ago, made some observations in Scotland which showed that the thermal usually starts near the middle of the field. One would expect that the air drawn in to fill its place would bend the surrounding corn and release the rest of the thermal.

* * *

A NEW method of testing sailplanes to determine their performance at all speeds is proposed in a recent issue of *Soaring* by C. A. Moeller, who says that the effect of unknown vertical air motions is interfering more and more with conventional testing methods as sailplane efficiencies increase. So he proposes that the machine under test should be released at 1,000 ft. and then dive to about 50 ft. above the ground, after which it would glide on at this height while its deceleration with time is accurately recorded.

From this, the drag at all speeds is easily calculated. The flight would be done in the early morning with no wind, to ensure that the air would be still.

The point about early-morning testing is that the land is too cold to produce thermals. Yet I know a test pilot who went to all the trouble of getting up before sunrise and then flew his machine out over the sea, which was likely to be warmer than the air at that time of day.

Correspondence

Under Not Overshooting

WITH reference to Mr. Delamer's letter last week (November 9), a check of my sources shows a Starways DC-4 accident at Dublin on Sept. 19 with extensive damage to the aircraft. Both *Flight* and THE AEROPLANE AND ASTRONAUTICS (Sept. 28) presented this as an overshoot but a newspaper report seems to indicate that it was an undershoot. In any event it makes little difference to the point of the article.

These various accounts of the one incident managed to get into separate files and I find that I was misled in thinking there were two accidents at Dublin in the period under review. I am sorry for the error.

London, W.2. "C.C.J."

[The Ministry of Aviation reported on Sept. 20: "Douglas DC-4 G-ARJY, owners and operators Starways, Ltd., of Liverpool, pilot McLean, with four crew and 60 passengers, on flight from Lourdes to Dublin, swung to the left and crash-landed one and a half miles E.S.E. of Dublin Airport. . . ." A study of the layout of Dublin Airport suggests that the accident happened when the aircraft was approaching Runway 24.—ED.]

Stearmans in Yugoslavia

AS one interested in agricultural aviation for a number of years now, I read with much pleasure the article in your Oct. 19 issue on "Flying the Swathmaster Stearman." I believe the Model 75 is still the most extensively used aircraft in this branch of air work.

When in Belgrade last spring, where I had been invited by the Yugoslav Civil Aviation Directorate to give them information on agricultural aviation methods and results in Western Europe, I saw parked at Belgrade-Zemun Airport several Boeing Stearmans which I was told are assisting the country's agriculture and forestry very effectively. So your correspondent is not quite correct in his statement that G-AROY is "the only Stearman in Europe." So far as I know, however, there is no other example of European use of the type.

Paris XV. HENRY BEAUBOIS
(Aeronautics Technical Adviser).

The Carrier's Liabilities

IN the letter published in your issue of Nov. 9, Mr. Caplan commented on certain points raised in my article, "Rationalizing the Carrier's Liabilities," which appeared in THE AEROPLANE AND ASTRONAUTICS of Sept. 21.

I am aware that summarizing a rather complicated legal matter may adversely affect the precision of the exposition. Having said that the amended Warsaw Convention cut down the legal requirements as to what the transport documents should contain (for it was not its business to lay down what else should be, for a variety of practical reasons, inserted in them as well) I believe I made it clear that the convention would require less work to comply with those requirements, and I am not opposed to Mr. Caplan's formulation of that idea.

But I think Mr. Caplan is utterly wrong when he insists that the provision excluding the liability of the carrier in case of negligent pilotage in the original Warsaw Convention "was inserted in imitation of maritime codes." The motives for such limitation of liability are to be found solely in the wish not to handicap air transport in its early stage by imposing too heavy a burden of liability; in fact, the British and French delegations proposed even wider range of its exclusion, covering the lack of airworthiness as well, which has no analogy in the maritime law. And Drion, in his well-known work on the subject, says plainly that "the simple statement that maritime law also has its limitation of liability can never in itself be a sufficient ground for limiting the carrier's or operator's liability in air law."

In my article I referred very briefly to the problem of air charter in connection with the carrier's liability, since this problem has not been covered by the amended Warsaw Convention. Therefore, I shall deal with Mr. Caplan's observations relating to this subject without going beyond the framework of the article. I fail to understand on what grounds he maintains that the charterer does not determine the fare under the contract of carriage. It is the charterer and the passenger, or consignor, who are the only parties to that contract, and not the airline, or aircraft owner. Who then can determine the fare except the charterer?

Equally incorrect is the assertion that the charterer "does not have commercial and operational control" of the aircraft. It is the essence of the charterer's business to acquire such control, and, of course, this view has been corroborated by a number of prominent legal authors. Conversely, I have not come across anyone who shares Mr. Caplan's view—except when the word "operational" is used in the sense of "navigational" control.

Finally, one sentence in Mr. Caplan's letter, viz. the penultimate paragraph, is not clear to me, but, if I understand it correctly, he denies that there is any need for the protection of a passenger or consignor, should the liability devolve from the airline to an impecunious charterer. May I point in reply to a statement in Shawcross and Beaumont to the effect that a provision should be incorporated in the new convention making the charterer and the operator jointly liable as carriers under the liability provisions of the convention, because "cases are known of charters being sub-contracted for the purpose of transferring liability from the responsible operator to a party less financially strong." This is in keeping with what I said in my article.

Maybe I am unduly optimistic, but, in view of the increasing interest in the provisions of the amended Warsaw Convention now displayed in many countries, it looks as if the few ratifications still needed for bringing it into operation will be shortly forthcoming.

Despite these disagreements, I feel grateful to Mr. Caplan for his remarks which have given me a chance of clarifying certain points on which my article has obviously not been explicit.

London, N.W.3. S. J. KONORSKI.

Wroundabout

Quick Sandys. People were surprised to read, "MR. SANDYS FLIES HOME AS BOMB AIMER IN CANBERRA, FLAT ON HIS BACK." Some interpreted the information as a revelation of toss-bombing technique, others reckoned that with the curse of the 1957 White Paper still upon him, he daren't turn his back on aircrew. I feel a contemplative wrhyme coming on:

Spare a thought for Mr. Sandys
Flying home from tropic lands,
Grateful now for bomber (manned)
Which in Paper White he'd planned
To change for rocket, for survival
—Swifter journey, sharp arrival.

*

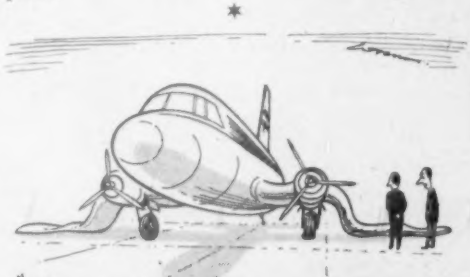
Awards Dept. Wren's Commendation goes this week to an Englishman, local representative of a British fuel company at an African, or maybe Indian, airfield, for Promptly Grasping a Golden Opportunity. When the no-English-speaking captain of a Russian Tu-104, diverted by weather to the airfield, indicated that he wanted refuelling but was unable to name a brand, our hero pointed to an American fuel company's tanker and said "Kennedy fuel?" then pointing to his own tanker, said "Macmillan fuel?" The Russian didn't hesitate.

*

Academachically Speaking. British aviation historian Robin Higham, who operates at the University of North Carolina, thought you'd like to hear this Deadly Definition:

Machiavellian: Intriguing approach to supersonic speeds.

*



"It's not often you come across so clear-cut a case of fatigue..."

by Wren

Industry Record

Sales Alliance

Stemming from associations begun when seeking systems equipment for the Gloster Javelin, a sales and marketing agreement has now been concluded between Armstrong Whitworth Equipment, Ltd., and the Christchurch firm of Penny and Giles, Ltd. Under this, A.W.E. is to market—on a World-wide basis within the Hawker Siddeley Group framework—the precision stabilizers, pressure transducers and the aircraft crash recorder produced by Penny and Giles.

A.W.E. first approached the Christchurch company when, during the building of the Javelin, there occurred the need for a rectilinear potentiometer in the pitch stabilizer system, to feed back the ram position to close the electronic servo loop. A Penny and Giles unit was selected after it had been type tested—a process involving four million operations—during which, it is said, no deterioration took place.

Miniature Miniaturization

At Glenrothes, Fife, the laboratories of Hughes International (U.K.), Ltd., are to be equipped for the production of the "dot" diode. This has been evolved by Hughes technicians in the U.S. in their efforts to design microminiature devices that will enable smaller airborne computers to be produced and also effect a significant weight saving in satellites and present generation military aircraft.

Diameter of the diode is 0.05-in.—about the size of a pinhead. Its thickness (or height) is 0.03 in.

Transistorized Amplifier

More miniaturization has been announced—this time by Amplivox, Ltd., who are manufacturing a new encapsulated three-transistor amplifier weighing about two-thirds of an ounce. With full M.o.A. type approval this is for use with high speech quality and noise-cancelling microphones replacing carbon units. It has a voltage gain of 50 db, and contains a surge limiting diode and an output control.

Applications for the unit include hand microphones, the handles of telephone handsets and aircraft radio transmitters, particularly those of American manufacture. Power is obtained from the polarizing voltage existing in the equipment.

In de Havilland's Hatfield factory is this new press, capable of exerting a 3,000-ton pressure, for the Redux process of metal-to-metal bonding by adhesion under temperature and pressure control. Built by Head Wrightson Teesdale, Ltd., it can fabricate Redux-bond panels up to 42 ft. long and 9 ft. wide.

Elliott-Automation Subsidiary

There has come news of the formation of a new company by Elliott-Automation, Ltd., known as E-A Space and Advanced Military Systems, Ltd.

This, it is proposed, will parallel in the non-industrial field E-A Automation Systems, Ltd., set up two years ago to apply to advanced systems techniques involving the products and knowledge of Elliott divisions in the automation field.

The new company, it is also planned, will play a part in promoting British military and space systems for European and other foreign countries.

Galley Equipment for the Trident

In our Sept. 14 issue, when reporting what was to be seen at Farnborough this year in the way of new galley equipment, we made mention of the hot cupboard and beverage container which G.E.C. is supplying to B.E.A. for use in the Trident. From Aerogalley, Ltd., we learn that as British Commonwealth agents for Dr. Stiebel Werke G.m.b.H. of Holzminden/Weser they, too, are supplying a hot cupboard to the Corporation for future use in this aircraft.

This is the Stiebel Eltron unit which for many years has been manufactured to international size. With an outer shell of aluminium alloy and an inner one of tin-plated brass it is available in two models—either with seven or eight aluminium trays.

During recent months, Aerogalley tells us, they have supplied hot cupboards of this type to United Arab Airlines, Middle East Airlines and Pakistan International Airlines.

France to Scale

For the private flier who proposes to take in France in his travels, the Tricolore Trading Co., Couesnon, Ltd., of 13 Suffolk Court, Leigham Court Road, London, S.W.16, is able to cater for his needs in the way of maps. This company, which is also U.K. agent for Scintex-Aviation, builders of the Emeraude, now has available maps detailing communications and navigation facilities to be found in France, both at airfields and en route, as well as standard air navigation charts of 1 : 500,000 scale. The company also retails the Estimocompas D.R. hand computer and a self-adhesive type of compass rose.

Aviation Calendar

Nov. 16

London.—R.Ae.S. Seventeenth British Commonwealth lecture, "The Progress of B.E.A. and of European Air Transport 1946-61," by Lord Douglas of Kirtleside, at 4 Hamilton Place, W.1, at 18.00 hrs.

Nov. 17

London.—Institute of Navigation lecture, "The Navigation and Guidance of Supersonic Aircraft," by Capt. W. L. Polhemus, at the Royal Institution of Naval Architects, 10 Upper Belgrave Street, S.W.1, at 17.30 hrs.

London.—R.Ae.S. Man Powered Aircraft Group lecture, "Aerodynamics of Man Powered Aircraft," by T. R. F. Nonweiler, at 4 Hamilton Place, W.1, at 18.00 hrs.

Luton.—R.Ae.S. Annual Dinner at the Leicester Arms Hotel, Luton, Beds.

Middlesbrough.—Institute of Transport, Tees-side Section lecture, "The Rôle of the Transport Helicopter," by Wg. Cdr. R. A. C. Brie, at the Cleveland Scientific and Technical Institution, at 18.30 hrs.

Nov. 21

London.—R.Ae.S. lecture, "Military Ground Effect Vehicles," by W. H. Coulthard, at 4 Hamilton Place, W.1, at 18.00 hrs.

Nov. 22

London.—R.Ae.S. Graduates' and Students' Section lecture, "Army Aviation," by Col. C. D. S. Kennedy, at 4 Hamilton Place, W.1, at 19.00 hrs.

London.—British Interplanetary Society all day symposium, "Materials in Space Technology," at the R.Ae.S., 4 Hamilton Place, W.1, at 09.30 hrs.

Nov. 23

London.—R.Ae.S. lecture, "Flight Characteristics of the B-58 Mach 2 Bomber," by B. A. Erickson, at 4 Hamilton Place, W.1, at 18.00 hrs.

Nov. 27

London.—R.Ae.S. Historical Group lecture, "The Society's Library and Aeronautical History," by F. H. Smith, at 4 Hamilton Place, W.1, at 18.00 hrs.

London Airport.—Institute of Transport, West Middlesex Group lecture, "A Pilot's View of Air Transport," by Capt. O. P. Jones, at London Airport Central, at 18.00 hrs.

Nov. 29

Weybridge.—R.Ae.S. R. K. Pierson Memorial Lecture, by Air Marshal Sir Geoffrey Tuttle, at the Apprentice Training School, Vickers-Armstrongs (Aircraft), at 17.45 hrs.

Nov. 30

London.—GAPAN Professional Licence Holders' Meeting, and Annual General Meeting, at the Innholders Hall, College Street, E.C.4, at 14.30 hrs. and 18.45 hrs. respectively.

Company Notices

INCREASES OF CAPITAL

Cramic Aircraft Components, Ltd. (595,658). Bridge Road, Southall.—Increased on May 15, 1961, by £75,000 in £1 ordinary shrs., beyond the reg. cap. of £125,000.

World Wide Aviation, Ltd. (664,369). Woodpeckers, Prince Consort Drive, Ascot.—Increased on Mar. 20, 1961, by £13,000 in £1 ordinary shrs., beyond the reg. cap. of £2,000.

New Patents

APPLICATIONS ACCEPTED

884,859.—**ACF Industries, Inc.**—"Simulated aircraft nosewheel steering system." April 16, 1959.

884,860.—**ACF Industries, Inc.**—"Limiter circuits." July 29, 1959. (July 29, 1958.)

884,893.—**Coffing Industries, Inc.**—"Attitude indicators for aircraft." Aug. 24, 1959. (Aug. 28, 1958.)

885,033.—**Vickers Aircraft Holdings, Ltd.**—"Aeroplanes." June 2, 1960. (June 2, 1959.)

885,105.—**Vickers Aircraft Holdings, Ltd.**—"Aeroplanes." Aug. 12, 1960. (Sept. 21, 1959.)

885,015.—**Daimler-Benz A.G.**—"Mounting of jet-propulsion power units on rotors of aircraft." Aug. 23, 1960. (Sept. 1, 1959.)

885,273.—**E. Hartman.**—"Ornithopters." Aug. 8, 1960. (May 8, 1959.)

Printed specifications of the above will be available on Dec. 20, 1961, and the opposition period will expire on Mar. 20, 1962.

Personal Notices

BIRTHS

Bendell.—On Nov. 5, at R.A.F. Hospital Akrotiri, Cyprus, to Jenny (*née* Robinson), wife of Flt. Lt. M. Bendell—a daughter.

Bullock.—On Nov. 5, at Princes Risborough, to Philippa (*née* Wynton), wife of Flt. Lt. I. B. Bullock—a daughter.

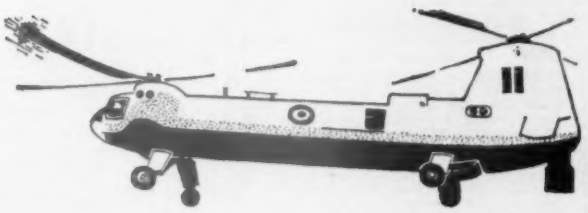
Burgess.—On Oct. 28, at Holyhead, to Mona (*née* Smith), wife of Flt. Lt. J. N. Burgess—a son.

Whittam.—On Nov. 1 at Queen Charlotte's Maternity Hospital, to Mary (*née* Betts), wife of Wg. Cdr. R. Whittam—a son.

DEATHS

Blackford.—On Oct. 29, Gp. Capt. Joseph Blackford, R.A.F. (retd.).

Sheil.—On Oct. 24, Wg. Cdr. Patrick Sheil, R.A.F. (retd.).



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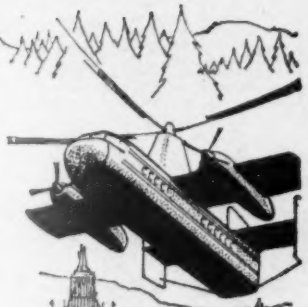

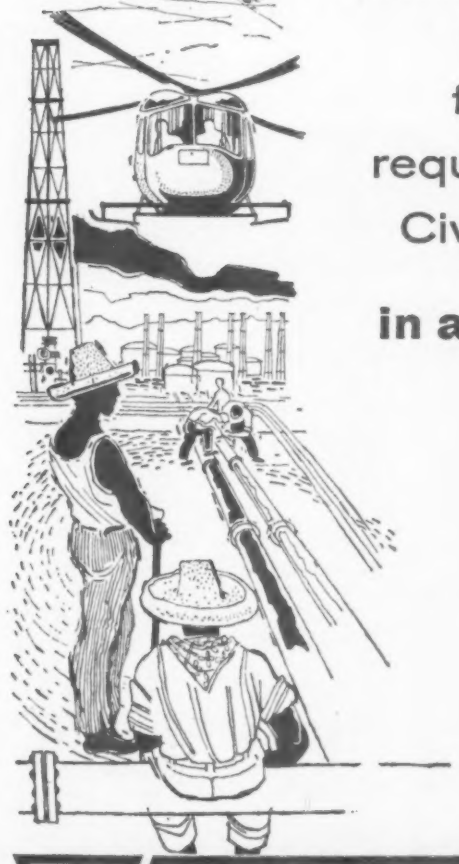

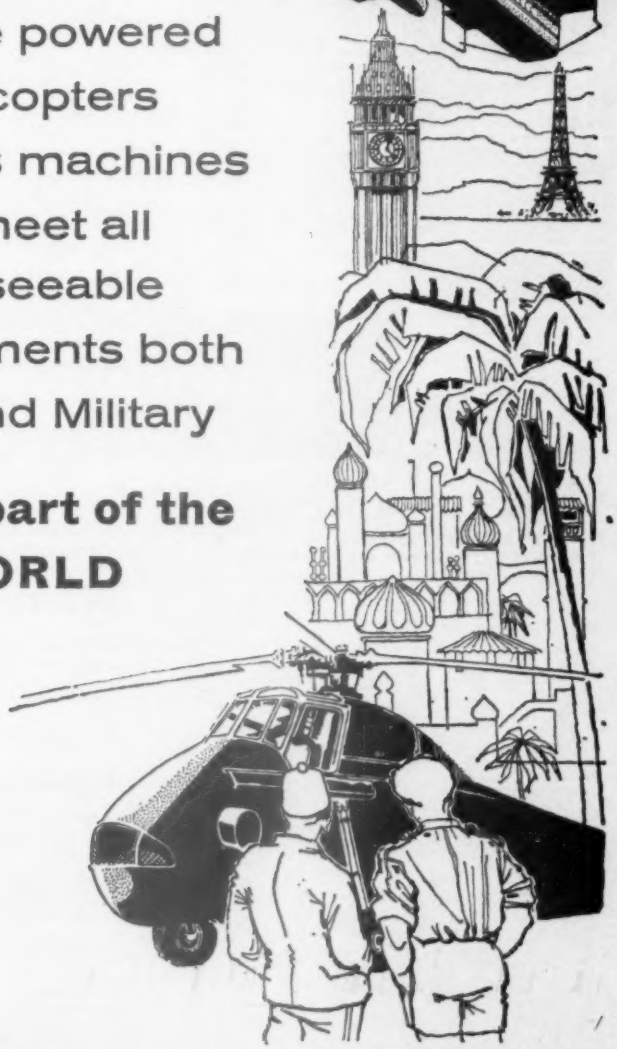

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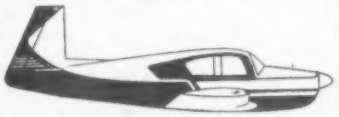

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NAVIGATION instructor required. Apply giving full details of experience to The Chief Instructor, Airwork Services Training, Perth Aerodrome, Perth. 615-694

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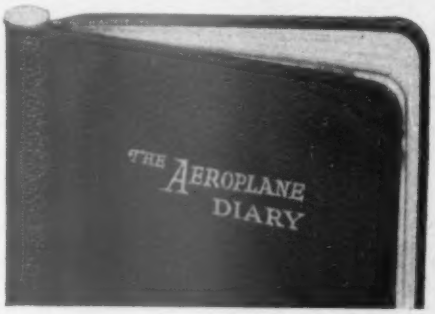

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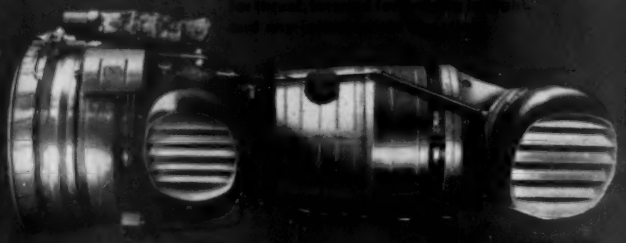

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